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AN OBSERVATION OF VARIABLE WATER-VAPOR CONTENT IN RAPIDLY-MOVING AIR MASSES

By ARTHUR ADEL and C. O. LAMPLAND

[Lowell Observatory, Flagstaff, Ariz., March 1939]

In the course of systematic measurements, at the Lowell Observatory, of the water-vapor content of the entire depth of the atmospheric column, an effort is being made to secure observations under varied conditions that should be fairly representative of the weather for the different seasons, including extreme as well as average conditions.

The present note deals with one of the rather unusual records. In the Southwest, in late autumn or winter, there occasionally blows a strong, cold, and dry wind from the northeast. This peculiar wind, which may continue for from 1 to 3 days, is accompanied by characteristic conditions, in that rarely is there any appreciable precipitation; the barometer is generally at maximum height; there is little or no cloudiness; and the surface humidity is low. The transparency of the atmosphere is excellent, as shown by the deep blue of the daytime sky and the sparkling brilliance of the stars at night. These strong winds from the northeast are, in general, accompanied by low temperatures, but there are exceptions to this condition.

The observations here to be described were made during such a wind.

As already mentioned, under these conditions humidity measurements by dry- and wet-bulb readings near the surface indicate a low water content for the air. This property was long ago found to be true for the entire atmospheric column as determined spectrographically in connection with the Observatory's planetary spectroscopic investigations. At that time, however, it was not feasible to determine quantitatively the absolute amount of water vapor in the atmospheric column. With the installation of a recording infrared spectrometer in 1937, such quantitative determinations have become a part of an Observatory program of atmospheric research. The spectroradiometer installation occupies the northeast corner of the main building of the Observatory, the building itself being located on the northeast promontory of the Observatory mesa. It may also be mentioned that on this high plateau and the mountainous regions to the northeast, there are no extended bodies of water.

The 23d of November 1938, offered a favorable opportunity to measure the water-vapor content of rapidly-moving air masses during a strong wind from the northeast. Fowle's spectroscopic method for determining the water-vapor content of the entire atmospheric column was employed, with the sun as the source of radiation; and the percentage absorption in the water vapor band Phi, center at 1.14 mu, was the specific item utilized on this date.

Three independent spectroscopic measures of water vapor were made respectively at 10:28 a. m., 10:34 a. m., and 10:47 a. m., M. S. T., surface temperature 25° F. The measures were accordingly made through very nearly air mass 2. Reduction to unit air mass, which may not be significant in view of such variability, yielded in millimeters of an equivalent layer of liquid water: 0.3, 0.8, and 0.5, given in order to correspond to the times of observations listed above.

It is worth mentioning that probably the reason for the fluctuation being of the order of the vapor content itself is in great measure the smallness of the latter. In other words, had this fluctuation of a fraction of a millimeter occurred during the wettest part of our summer rainy season when the water-vapor content of the air averages about 18 millimeters it would have passed unnoticed.

UNUSUAL FLUCTUATIONS IN THE DEW-POINT ALONG THE SOUTHERN CALIFORNIA COAST

By DEAN BLAKE

[Weather Bureau Office, San Diego, Calif., June 1938]

San Diego was one of the first Weather Bureau stations to use hygrometrical data in predicting minimum temperatures. In 1917, Henry F. Alciatore, then in charge, experimented with formulas for the citrus belt of San Diego County, the basis being the dry-bulb and dew-point temperatures, and the relative humidity at the regular 5 p. m. observations (P. S. T.). Besides developing hygrometrical formulas, various of the other methods then being tested, such as the "least square" and "median temperature," were carefully studied and applied.

It was early discovered that there was a sufficiently constant relation between the dew-point at San Diego and minimum temperatures the next morning at back-country stations to justify the issuance of forecasts. This was particularly gratifying as the observations were taken 62 feet above ground on the roof of the Post Office and Custom House Building, and the elevations of the stations, for which the predictions were made, were from 110 to 657 feet above sea level, and their distances from San Diego ranged from 8 to 32 miles.

After further investigation a statistical method employing combinations of the dry-bulb temperature, dew-point, and relative humidity at 5 p. m. was adopted as the most practical and accurate. In view of the lack of psychrometric readings at the stations for which the predictions were made, the percentage of verification was unexpectedly high.

In the main, Alciatore's method is still in use at San Diego, and the dew-point, because of its relative conservatism, continues the basis for the predictions. It is true,

however, that there has been a steady improvement in the forecasts; the reasons for this are that the psychrometric data are available from all of the key stations, and that the evening weather map is now employed for estimating the influences of wind and cloudiness and for estimating the movements of the air masses involved.

When the teletypewriter was installed some years ago, the airway sequences became available to the city office. From them it was discovered that at the stations near the ocean there were wide and rapid fluctuations in the dew-point under certain pressure situations. In some cases the changes were so large from hour to hour that verification of the reports was requested. The remarkable variation of 20° to 30° occasionally took place between the sequences. In fact, the fluctuations were greater than those of the temperature at some of the stations, and, after some study, the conclusion was reached that the observations at coastal stations were not dependable air-mass indicators, and that one sequence of reports alone was of little value in our predictions.

It has been known for some time that, under certain pressure conditions over the Far West, dew-points are far from constant. Floyd Young has discussed nocturnal changes in the dew-point at Medford[1] and later emphasized that their use in minimum temperature predictions was limited because of these changes,[2] However, as hygrometrical data are still used in the frost work in San Diego, any material change in the moisture content of the air during the night must be foreseen if the forecasts are to be of value to the growers.

Our citrus districts frequently are the last to experience the change in air mass with the passage of cold or occluded fronts, and it is not at all unusual for firing to take place in the areas around Pomona and Redlands, while showers are still falling in San Diego County. In such situations reports from the north are invaluable, and, since the airway sequences have been received every hour, they have proven extremely helpful.

In the accompanying figure the temperature and dew-point readings at the sequences, 41 minutes past the hour, are shown on January 6 and 7, 1938, for the airway stations at Laguna Beach and Oceanside, and the airport stations at Burbank and San Diego. The weather map on both of these dates showed a large anticyclone over western United States with the center over southern British Columbia. Winds aloft were from the north or northeast, but as the high area was in the process of breaking down velocities were light.

Hourly and diurnal changes in the dew-point at the coastal stations of southern California are normally very small, and the unusual fluctuations shown in the figure occur only when dry descending wind or *S* air prevails. These abnormal variations are found on the border line between the moist ocean air and the dry land air, and it is the seesawing back and forth of the widely differing masses that causes the sudden changes.

This is further exemplified by a brief description of the location of each of the stations.

The station at Laguna Beach is about one-half mile from the ocean, and is situated on the slope of a hill which rises several hundred feet to the east and northeast. During the early evening the air flows down this incline, especially when the gradient winds are in that general direction. When it reaches the station, the humidity and dew-point both drop rapidly, but the temperature fall is slight as the air is heated somewhat in descent. The breeze usually diminishes after the early evening hours, and fluctuations in moisture content take place as the front between the maritime and land air masses moves back and forth.

At Oceanside, the situation is somewhat different. It, too, is about one-half mile from the ocean, but here the airway station is in a shallow valley running in an east-west direction, and the wind is usually stronger and the dynamical effects less pronounced than at Laguna Beach. As a result, there is a gradual fall in both dew-point and temperature when the cooler, drier land breeze prevails, and a rise when the moist, ocean air sweeps by during the day.

The assertion that the fluctuations are due to the proximity to the ocean is borne out by the sequence reports. These show that the dew-point at both Laguna Beach and Oceanside rises materially with the arrival of the sea breeze, usually about 10 or 11 a. m., and falls shortly after sunset with the advent of the land breeze.

At the San Diego airport station, which is located several miles from the ocean, but on the shore of San Diego Bay at the base of a hill about 200 feet high, the dew-point fluctuates more than at Oceanside but less than at Laguna Beach. This is what one would expect. It is a matter of observation that even the distance of a mile or two may affect the readings when the land and sea breeze prevails, and simultaneous readings at the city office and the airport often show considerable difference.

On the other hand, the Burbank airport station is located so far inland that the moisture content of the air remains relatively constant, and the temperature extremes are effected without much change in the dew-point.

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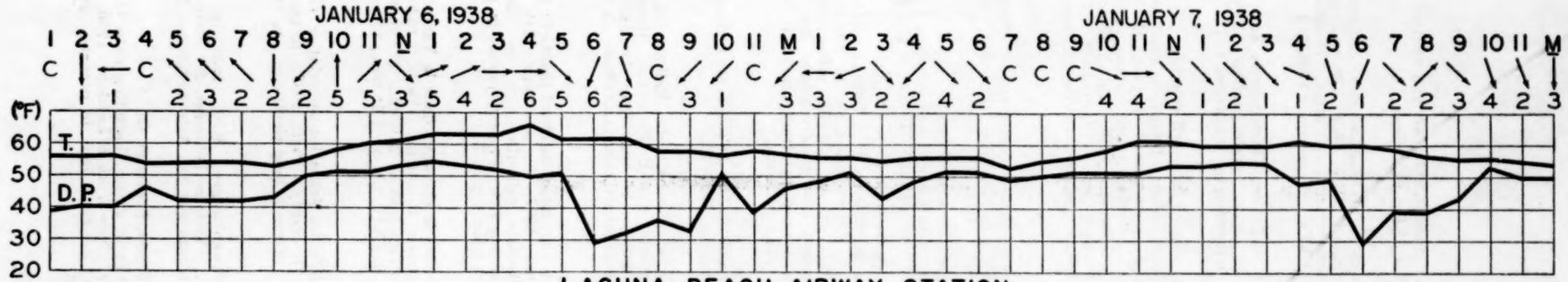
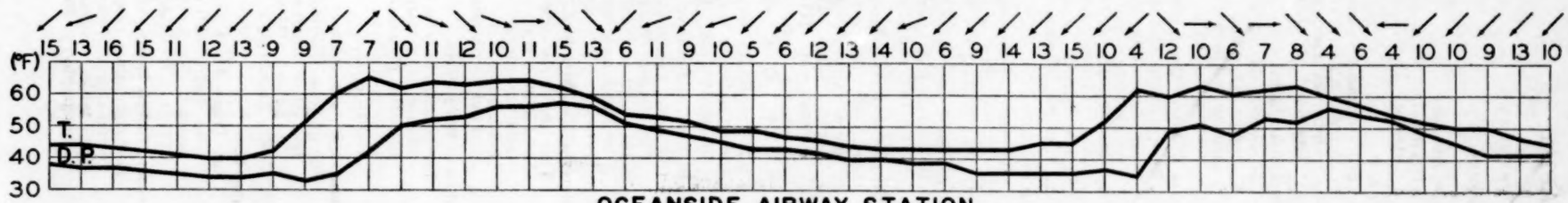
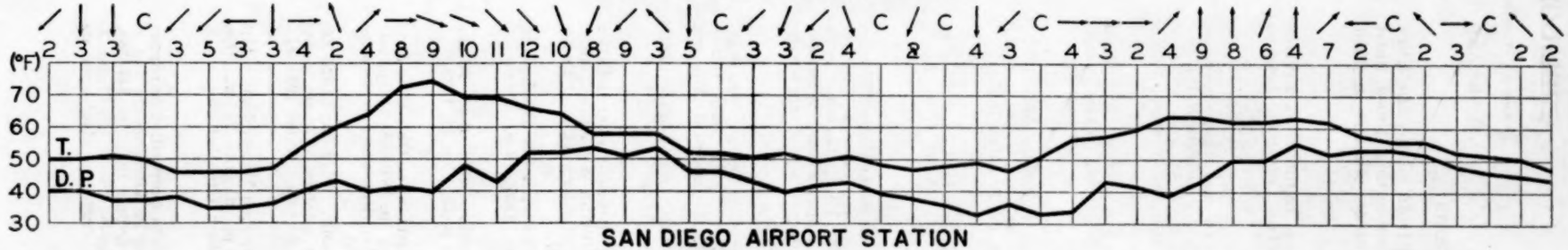


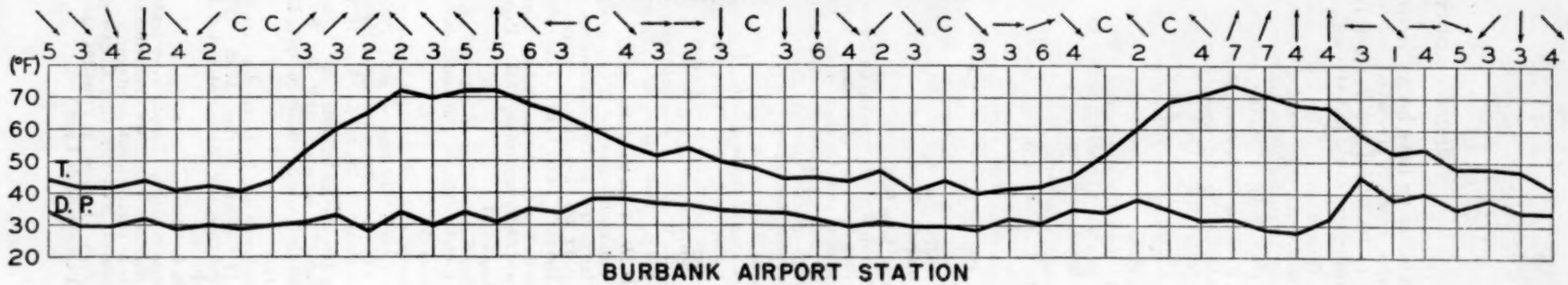
LAGUNA BEACH AIRWAY STATION



OCEANSIDE AIRWAY STATION



SAN DIEGO AIRPORT STATION



BURBANK AIRPORT STATION

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By AMY P. LESHER

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SOLAR OBSERVATIONS

[Meteorological Research Division, EDGAR W. WOOLARD in charge]

SOLAR RADIATION OBSERVATIONS, FEBRUARY 1939

By IRVING F. HAND

Measurements of solar radiant energy received at the surface of the earth are made at eight stations maintained by the Weather Bureau, and at nine cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory of Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data, obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, 65: 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian pyrheliometer at Blue Hill. The table also gives vapor pressures at 8 a. m. (75th meridian time) and at noon (local mean solar time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct radiation averaged close to normal for February at Madison and above normal at the other three stations.

Total solar and sky radiation was above normal at all stations for which normals have been computed with the exception of Fresno, Fairbanks, Twin Falls, Ithaca, Blue Hill, and Newport.

No polarization measurements were made at Madison owing to continual snow or ice cover.

LATE DATA

The weekly means of total solar and sky radiation, expressed in gram-calories, for the weeks beginning January 1, 8, 15, and 22, 1939, at Miami, Fla., are as follows: 317, 324, 326, and 335, respectively, with corresponding departures of +25, +27, +40, and +5.

TABLE 1.—*Solar radiation intensities during February 1939*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Feb. 1	3.99	0.78	0.88	1.10	------	------	------	------	------	------	3.63
Feb. 7	2.62	------	------	.63	------	------	------	------	------	------	2.26
Feb. 8	1.68	.58	.64	.71	1.01	------	------	------	------	------	1.68
Feb. 12	4.75	------	1.05	1.17	1.33	------	------	1.20	------	------	5.56
Feb. 13	4.17	1.00	1.14	1.30	1.48	------	------	1.26	------	------	3.81
Feb. 16	3.81	------	------	------	1.30	------	------	------	------	------	3.15
Feb. 18	2.16	------	------	------	1.18	------	------	------	------	------	1.78
Feb. 23	4.95	------	.74	.98	1.27	------	------	------	------	------	3.99
Means	------	.79	.89	.98	1.26	------	------	(1.23)	------	------	------
Departures	------	+.07	+.06	−.02	+.06	------	------	+.22	------	------	------

MADISON, WIS.

Feb. 2	1.45	0.52	0.69	------	------	------	------	------	------	------	1.60
Feb. 3	.86	1.00	------	------	1.50	------	------	------	------	------	1.24
Feb. 8	3.99	------	------	------	1.20	------	------	------	------	------	1.19
Feb. 11	.56	.84	.99	1.36	1.38	------	------	------	------	------	.66
Feb. 13	3.30	------	------	.85	------	------	------	------	------	------	3.63
Feb. 15	.86	1.10	1.21	1.38	1.52	------	------	------	------	------	.71
Feb. 17	1.19	.69	------	------	------	------	------	------	------	------	1.60
Feb. 18	3.30	.92	------	------	------	------	------	------	------	------	3.81
Feb. 24	1.02	1.02	1.17	------	1.43	------	------	------	------	------	1.32
Feb. 25	.91	------	1.00	------	1.37	------	------	------	------	------	1.19
Means	------	.87	1.01	1.20	1.40	------	------	------	------	------	------
Departures	------	−.05	−.05	0	+.03	------	------	------	------	------	------

LINCOLN, NEBR.

Feb. 1	3.45	------	------	0.77	------	------	------	0.93	0.84	0.72	1.96
Feb. 2	1.32	1.10	1.25	1.37	1.56	------	1.53	1.38	------	1.12	1.02
Feb. 3	1.24	------	------	------	------	------	------	1.24	1.06	------	1.24
Feb. 5	2.49	------	------	------	------	------	1.40	1.24	1.12	1.00	2.62
Feb. 6	2.26	------	1.18	1.31	1.44	------	------	1.34	1.19	1.07	2.26
Feb. 10	.56	------	------	1.40	1.55	------	1.56	1.34	1.14	.96	.64
Feb. 11	.58	.82	1.04	1.22	1.42	------	1.41	1.18	------	------	.94
Feb. 13	3.66	.78	.84	1.18	1.49	------	------	------	------	------	4.17
Feb. 14	1.78	1.02	1.11	1.30	1.46	------	------	------	------	------	3.15
Feb. 17	2.95	.93	1.12	1.26	1.51	------	1.52	1.33	1.18	1.06	2.62
Feb. 21	.79	1.00	------	1.14	1.39	------	------	------	------	------	1.02
Feb. 22	.74	------	------	------	1.50	------	------	------	------	------	1.02
Feb. 25	1.78	1.00	1.14	1.30	1.48	------	------	1.24	1.10	.96	.86
Feb. 28	3.00	------	------	------	------	------	------	1.36	1.23	1.15	2.26
Means	------	.95	1.10	1.22	1.47	------	1.48	1.26	1.11	1.00	------
Departures	------	+.02	+.07	+.05	+.10	------	+.12	+.10	+.09	+.08	------

BLUE HILL, MASS.

Feb. 1	1.1	1.14	1.23	1.34	1.45	------	1.42	1.27	1.14	------	1.7
Feb. 4	3.3	------	------	------	------	------	------	1.18	1.12	1.05	------
Feb. 9	3.3	.74	.88	1.04	1.31	------	------	1.18	1.12	1.05	2.5
Feb. 11	------	------	------	------	------	------	------	1.12	1.04	.90	1.8
Feb. 12	1.4	1.01	1.10	1.21	1.40	------	1.38	------	------	------	1.4
Feb. 16	1.1	1.06	1.15	1.30	1.46	------	1.41	1.28	1.12	1.06	.5
Feb. 23	1.2	1.02	1.12	1.21	1.41	------	1.30	1.12	.99	.85	1.4
Feb. 25	1.4	1.20	------	1.20	1.37	------	------	------	------	------	1.4
Feb. 27	4.4	.68	.83	1.02	1.28	1.40	------	------	------	------	3.6
Means	------	.98	1.05	1.19	1.38	(1.40)	1.36	1.19	1.08	.96	------
Departures	------	+.06	+.04	+.10	+.09	−.06	+.08	+.02	+.01	−.04	------

[1] Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	San Juan	Friday Harbor	Ithaca	Newport
	Gram-calories per square centimeter																
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Jan. 29	134	199	205	136	103	130	54	186	282	359	257	210	147	463	.....	91	141
Feb. 5	239	196	279	190	159	219	96	169	334	372	232	302	194	516	.....	143	200
Feb. 12	302	282	306	233	222	297	69	221	414	339	295	392	251	558	.....	183	272
Feb. 19	294	283	302	160	224	393	21	309	410	348	302	372	250	560	.....	170	264
	Departures of daily totals from normals																
Jan. 29	−66	+13	−19	+17	−48	−82	+2	−4	−2	+22	+36	−29	−64	−8	.....	−57	−52
Feb. 5	+28	−7	+19	+51	−4	−68	+23	−36	+48	+28	+4	+25	−41	+23	.....	−28	−26
Feb. 12	+77	+58	+36	+86	+48	−20	−20	−47	+101	−5	+42	+85	+19	+46	.....	+25	+18
Feb. 19	+40	+31	+4	−16	+28	+115	−95	+52	+50	−13	+18	+27	−16	+28	.....	−34	+4
	Accumulated departures since Jan. 1																
	+1,043	+21	+112	+596	+427	−588	−707	−1,190	+1,701	+903	+1,981	−231	−546	+2,352	.....	−603	−427

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.) Superintendent, U. S. Naval Observatory. Data from measurements at the U. S. Naval Observatory from plates obtained at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's visible hemisphere. For each day, below longitude, latitude, area of spot or group, and spot count, are given respectively the assumed longitude of the center of the disk, assumed latitude of the center of the disk, total area of spots and groups, and total spot count]

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality [1]	Observatory
1939	A. m.		°	°	°	°				
Feb. 1	11 25	6298	−55	205	−18	56	97	1	F	U. S. Naval.
		6297	−30	230	+18	38	73	6		
		6293	−2	258	−10	4	73	7		
		6293	+7	267	−11	8	679	50		
		6291	+28	288	+15	35	48	1		
		6291	+37	297	+16	43	73	1		
		6299	+52	312	−7	52	6	2		
		6292	+62	322	−15	62	24	1		
		6290	+75	335	−8	75	218	3		
				(260)	(−6)		1,291	72		
Feb. 2	11 19	6304	−75	172	+7	77	24	4	G	Mt. Wilson.
		6303	−75	172	−12	75	12	2		
		6298	−41	206	−18	43	85	1		
		6297	−17	230	+18	30	61	4		
		6302	−9	238	−8	10	48	8		
		6293	+9	256	−11	11	73	15		
		6293	+17	264	−11	18	315	8		
		6293	+23	270	−12	25	291	10		
		6291	+42	289	+15	47	24	4		
		6291	+51	298	+16	56	73	2		
		6299	+67	314	−8	67	24	4		
		6300	+75	322	+13	78	24	2		
				(247)	(−6)		1,054	64		
Feb. 4	10 54	6306	−61	160	+6	62	97	6	P	U. S. Naval.
		6306	−53	168	+6	55	48	5		
		6298	−15	206	−18	20	48	2		
		6302	+19	240	−8	19	339	12		
		(*)	+49	270	−10	49	145	9		
		6291	+79	300	+16	81	109	2		
				(221)	(−6)		786	36		
Feb. 5	11 25	6306	−45	162	+6	47	170	8	F	Do.
		6298	−3	204	−17	12	61	1		
		6302	+31	238	−9	32	436	20		
		6293	+63	270	−10	63	145	6		
				(207)	(−6)		812	35		
Feb. 6	11 20	6306	−31	163	+7	34	97	5	F	Mt. Wilson.
		6304	−23	171	+7	26	73	3		
		6298	+10	204	−18	16	73	1		
		6306	+25	219	+8	29	97	12		
		6302	+45	239	−9	46	436	15		
		6293	+76	270	−10	76	97	3		
		6307	+79	273	−16	79	97	2		
				(194)	(−6)		970	41		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality [1]	Observatory
1939			°	°	°	°				
Feb. 7	10 22	6306	−17	164	+7	21	194	40	G	U. S. Naval.
		6305	−12	169	+13	23	12	2		
		6298	+23	204	−18	26	36	2		
		6308	+38	219	+7	41	97	11		
		6302	+58	239	−9	58	218	15		
				(181)	(−6)		557	70		
Feb. 8	11 35	6306	−4	164	+7	14	194	32	P	Do.
		6298	+37	205	−18	39	12	2		
		6308	+52	220	+7	55	73	6		
		6302	+71	239	−9	71	145	10		
				(168)	(−6)		424	50		
Feb. 9	10 57	6311	−58	97	+27	66	61	3	G	Do.
		6306	+11	166	+7	16	242	30		
		6298	+50	205	−19	51	12	1		
		(*)	+67	222	+5	69	12	1		
				(155)	(−7)		327	35		
Feb. 11	11 30	6313	−74	54	−17	74	582	8	G	Do.
		6312	−68	60	+8	70	242	2		
		6311	−31	97	+27	45	61	1		
		6310	−7	121	+18	25	48	5		
		6309	+15	143	+25	35	121	8		
				(128)	(−7)		1,054	24		
Feb. 12	11 7	6313	−70	45	−19	70	242	3	F	Do.
		6313	−61	54	−17	61	339	4		
		6312	−54	61	+8	56	242	2		
		6311	−18	97	+27	38	61	2		
		6310	+6	121	+18	26	61	3		
		6309	+28	143	+25	42	291	18		
		6314	+39	154	−22	41	48	3		
				(115)	(−7)		1,284	35		
Feb. 13	10 45	6313	−56	44	−19	59	145	6	P	Do.
		6313	−49	53	−17	50	436	8		
		6312	−40	62	+7	42	194	3		
		6311	−5	97	+27	34	48	2		
		6310	+19	121	+18	31	48	5		
		6309	+42	144	+25	52	242	20		
		6314	+53	155	−22	55	48	3		
				(102)	(−7)		1,161	47		
Feb. 14	11 6	6313	−46	43	−19	47	145	5	G	Mt. Wilson.
		6313	−37	52	−18	39	533	15		
		6312	−27	62	+7	30	121	10		
		6311	+7	96	+26	34	48	2		
		6310	+31	120	+18	39	61	9		
		6309	+54	143	+25	61	242	15		
		6314	+67	156	−23	68	12	3		
				(89)	(−7)		1,162	59		

See footnotes at end of table.

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality [1]	Observatory
1939			°	°	°	°				
Feb. 15...	10 48	6313	−36	40	−19	38	242	6	G	Mt. Wilson.
		6313	−25	51	−17	27	485	15		
		6312	−17	59	+8	22	97	4		
		6311	+19	95	+28	40	36	1		
		6310	+44	120	+18	50	48	4		
		6309	+68	144	+25	72	61	8		
				(76)	(−7)		969	38		
Feb. 16...	12 25	6313	−21	41	−19	24	145	6	VP	U. S. Naval.
		6313	−9	53	−17	14	388	1		
		6312	−1	61	+7	13	97	1		
		6316	+15	77	+12	24	170	5		
		6311	+34	96	+26	47	48	1		
				(62)	(−7)		848	14		
Feb. 17...	14 24	6313	−7	41	−19	14	97	5	P	Do.
		6313	+6	54	−17	12	436	1		
		6319	+8	56	+13	22	97	2		
		6312	+12	60	+8	19	61	1		
		6318	+19	67	+13	27	36	1		
		6316	+30	78	+12	35	242	8		
		6311	+48	96	+26	57	36	1		
				(48)	(−7)		1,005	19		
Feb. 18...	11 8	6313	+3	39	−19	13	61	8	P	Do.
		6313	+17	53	−17	19	436	1		
		6319	+20	56	+13	28	61	7		
		6312	+24	60	+8	28	61	1		
		6318	+30	66	+13	36	97	3		
		6316	+42	78	+13	47	242	8		
				(36)	(−7)		958	28		
Feb. 19...	11 41	6321	−70	313	+15	73	36	2	G	Mt. Wilson.
		6320	−66	317	−9	66	36	3		
		6313	+39	53	−17	32	436	1		
		6319	+31	54	+12	36	85	8		
		6312	+39	62	+7	41	61	1		
		6316	+55	78	+13	59	291	8		
				(23)	(−7)		945	23		
Feb. 20...	11 17	6325	−83	287	−19	83	194	2	VG	U. S. Naval.
		6324	−78	292	+30	82	242	1		
		6321	−55	315	+17	60	97	9		
		6320	−51	319	−9	51	36	4		
		6323	−31	339	−25	35	36	8		
		6322	−2	8	−9	3	97	19		
		6313	+43	53	−17	45	436	1		
		6319	+48	58	+13	52	97	16		
		6312	+51	61	+8	53	36	6		
		6316	+68	78	+14	70	351	7		
				(10)	(−7)		1,622	73		
Feb. 21...	12 25	6325	−71	285	−18	71	242	5	F	Do.
		6324	−67	289	+31	75	218	1		
		6321	−41	315	+17	47	97	5		
		6320	−37	319	−9	37	36	2		
		6323	−20	336	−25	27	73	8		
		6322	+13	9	−9	14	121	10		
		6313	+58	54	−17	59	388	1		
		6319	+63	59	+12	67	85	2		
		6312	+66	62	+7	68	36	2		
		6316	+80	76	+13	82	145	1		
				(356)	(−7)		1,441	37		
Feb. 22...	12 56	6326	−85	258	−18	84	388	2	F	Do.
		6325	−59	284	−18	59	121	7		
		6324	−53	290	+30	64	291	2		
		6321	−28	315	+17	37	97	7		
		6320	−23	320	−10	23	48	10		
		6323	−7	336	−25	20	48	5		
		6322	+27	10	−9	27	218	9		
		6313	+71	54	−17	71	436	1		
		6319	+78	61	+13	80	85	1		
				(343)	(−7)		1,732	44		
Feb. 23...	11 21	6326	−70	260	−18	70	339	1	F	Do.
		6325	−45	285	−18	46	218	7		
		6324	−40	290	+30	54	218	1		
		6321	−13	317	+16	26	97	8		
		6320	−10	320	−10	11	121	9		
		6323	+6	336	−26	20	48	7		
		6322	+41	11	−10	41	242	8		
		6327	+53	23	+10	57	48	3		
		6313	+85	55	−17	85	388	1		
				(330)	(−7)		1,719	45		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality [1]	Observatory
1939			°	°	°	°				
Feb. 24...	13 55	6328	−70	246	−14	70	48	1	F	U. S. Naval.
		6326	−58	258	−19	59	485	5		
		6331	−49	267	+24	67	48	1		
		6325	−31	285	−19	33	194	6		
		6324	−26	290	+30	45	291	1		
		6321	−1	315	+17	23	97	7		
		6320	+2	318	−10	4	48	10		
		6323	+20	336	−26	27	61	6		
		6330	+21	337	−16	23	12	2		
		6329	+24	340	+6	27	36	3		
		6322	+55	11	−10	55	291	8		
		6327	+70	26	+11	72	12	1		
				(316)	(−7)		1,623	51		
Feb. 25...	11 13	6328	−59	245	−14	59	48	2	G	Do.
		6326	−46	258	−19	47	436	7		
		6331	−38	266	+24	49	24	2		
		6325	−19	285	−19	23	145	3		
		6324	−12	292	+30	39	194	1		
		6321	+9	313	+19	27	12	2		
		6321	+14	318	+15	18	73	8		
		6320	+15	319	−9	16	36	12		
		6329	+37	341	+7	39	48	3		
		6330	+37	341	−17	38	97	10		
		6322	+64	8	−9	64	48	3		
		6322	+71	15	−10	71	194	1		
				(304)	(−7)		1,355	54		
Feb. 26...	16 13	6328	−43	245	−15	45	48	4	G	Do.
		6326	−31	257	−19	33	533	10		
		6325	−3	285	−19	13	61	3		
		6324	+2	290	+30	37	145	2		
		6321	+26	314	+19	37	24	4		
		6320	+29	317	−8	29	170	15		
		6321	+29	317	+17	37	6	1		
		6330	+52	340	−16	53	158	4		
				(288)	(−7)		1,145	43		
Feb. 27...	11 29	6333	−80	197	−20	80	97	2	G	Do.
		6328	−32	245	−15	34	48	3		
		6332	−25	252	−10	26	12	1		
		6326	−19	258	−19	23	436	9		
		6325	+9	286	−20	16	97	5		
		6324	+12	289	+30	39	145	3		
		6321	+38	315	+19	46	97	9		
		6320	+40	317	−8	40	436	18		
		6330	+63	340	−16	63	145	5		
				(277)	(−7)		1,513	55		

[1] Plate quality.
*Not numbered.
VG, very good; G, good; F, fair; P, poor; VP, very poor.
Mean daily area for 25 days equal 1,110.

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR FEBRUARY 1939

[Dependent alone on observations at Zurich]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich Switzerland]

February 1939	Relative numbers	February 1939	Relative numbers	February 1939	Relative numbers
1	*b 78	11	d 49	21	dd 92
2	*Mc 88	12	73	22	d 96
3	ad 97	13		23	98
4	67	14	76	24	a 93
5	56	15	56	25	112
6	Mc 82	16	Mac 62	26	a 74
7	76	17	Mac 62	27	101
8	a 85	18	61	28	92
9	64	19	EEcc 62		
10	Eacd 44	20	EMcc 82		

Mean, 27 days=77.0.

*=Chur (temporary observation station).
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL SUMMARY

[Aerological Division, D. M. LITTLE in charge]

By B. FRANCIS DASHIELL

During February 262 airplane and 193 radiosonde observations were made in the United States, and a few of the latter attained a maximum height of 18 kilometers. Only 28 percent of the radiosonde flights reached 16 kilometers, as compared to 46 percent in January. Beginning with February, additional pilot-balloon observations from 10 stations in the United States, Canada, Mexico, and Cuba were included in the upper-air charts. A complete description of tables 1, 1a, 2, 3, and 4, and charts VIII, IX, X, XI, and XII, which contain the aerological data for the current month, appeared in the January 1939 MONTHLY WEATHER REVIEW.

The weather during February was in marked contrast to that which prevailed in the preceding month when mean *surface* temperatures (°F.) everywhere, particularly in the Northwest, were abnormally excessive. But, during the current month, mean temperatures over all sections of the country west of the Mississippi Valley were decidedly below normal, while in the East the weather was somewhat warmer than normal. In the upper air, for all levels *above* the surface, the mean free-air temperature (° C.) for February was lowest over Fargo, N. Dak., and Sault Ste. Marie, Mich., up to 1.5 kilometers; over Fargo, N. Dak., from 2 to 10 kilometers; over Oakland, Calif., from 11 to 14 kilometers; over Nashville, Tenn., at 15 and 16 kilometers; and over Washington, D. C., at 17 kilometers. The highest mean free-air temperatures for the United States were found over Nashville, Tenn., Washington, D. C., and Oakland, Calif. But, above 10 kilometers, Sault Ste. Marie, Mich., became the warmest station, while Fargo, N. Dak., and Omaha, Nebr., were only slightly colder.

In the lower levels where upper-air observations are made by airplane and radiosonde, all stations, except Nashville, Tenn., Lakehurst, N. J., Washington, D. C., and Pensacola, Fla., definitely showed that lower mean temperatures prevailed during February than in the preceding month. The difference between the means for the two months was outstanding at Billings, Mont., where the temperatures for the current month ranged from 8.9° C. colder at the surface, to 6.6° C. colder at 5 kilometers. February, however, was only slightly colder at El Paso, Tex., Norfolk, Va., San Diego, Calif., and Seattle, Wash., at all levels. At the four stations where the February means were higher than in January, the temperature differences at each level were moderate, but, in this group, Washington, D. C., had the largest average difference of +1.6° C.

Above 5 kilometers, Oakland, Calif., had lower mean temperatures in February than during January at all levels up to 18 kilometers. But, on the other hand, Nashville, Tenn., was warmer in February at all levels up to 17 kilometers. And, at both of these stations, the temperature differences between the current month and January increased steadily with altitude.

February mean temperatures were lower than during the preceding month at all levels from the surface up to 9 kilometers over Oklahoma City, Okla.; up to 10 kilometers over Omaha, Nebr.; and up to 11 kilometers over Fargo, N. Dak., and Sault Ste. Marie, Mich. Above these levels it was found that the February temperatures were warmer than in January, with the monthly differences for each level increasing with altitude. This difference was as much as +6.8° C. over Omaha, Nebr., at 18 kilometers. Conditions, however, were the opposite over Washington, D. C., for the current month was warmer than January at all levels up to 10 kilometers, and then steadily colder by as much as −5.1° C. at 17 kilometers.

The distribution of mean free-air pressures for February was such that low pressure prevailed generally over the northern Great Lakes region and east and northeastward over the entire St. Lawrence valley to Newfoundland, where slightly lower pressure was centered. In the United States, however, the lowest pressure occurred over Sault Ste. Marie, Mich., up to 5 kilometers, and over Fargo, N. Dak., at all higher levels. High presssure centered over the South, being noted at Pensacola, Fla., below 5 kilometers, and over Nashville, Tenn., above 5 kilometers. The difference in pressures between these two northern and southern "low" and "high" areas was found to increase at each level with altitude, becoming 31 millibars at 5 kilometers, and then decreasing with altitude to 9 millibars at 15 kilometers. The highest pressures for the month of February were essentially the same at each level as those which were recorded during the previous month, but the current low pressures became steadily less with altitude at all levels, ranging from 1 to 4 millibars, at 2 and 12 kilometers, respectively.

Mean relative humidity was highest during February over the upper Mississippi valley and the northern Great Lakes region. Comparatively high humidities also were found over the Northwest and the northern Rocky Mountain regions. Low mean humidities appeared over Norfolk, Va., in all levels up to 2.5 kilometers, and over Pensacola, Fla., and El Paso, Tex., at all levels above 3 kilometers. Extremes of humidity ranged from 94 percent at 0.5 and 1 kilometer over Sault Ste. Marie, Mich., to 25 percent over Pensacola, Fla., and El Paso, Tex., at 5 kilometers.

The resultant wind directions, as shown in table 2 and on charts VIII to XI, inclusive, showed a rather uniform flow of air at all levels. Winds from the northwest quadrant covered the entire Northwest, where the February weather was below normal. But in the eastern and southern areas, where surface temperatures were above normal, the resultant winds were westerly and southwesterly, even up to 5 kilometers. Northwesterly and northerly winds prevailed along the Pacific coast. In the far South, particularly in Cuba and portions of Mexico, the resultant directions had southerly and easterly components. Such distribution gave a smooth "stream-line" effect to the entire mass movement of the atmosphere in February, as shown in charts VIII, IX, X, and XI.

Table 2 shows resultant winds and velocities based on 5 p. m. (E. S. T.) observations. Comparing many of these winds with the normals for 5 a. m. (E. S. T.) observations, it was found that, at Atlanta, Ga., Nashville, Tenn., Washington, D. C., St. Louis. Mo., Brooklyn, N. Y., Chicago, Ill., and Sault Ste. Marie, Mich., the resultant wind directions "backed" at all levels by departing decidedly from the normals in counterclockwise rotations. But, at Medford, Oreg., Salt Lake City, Utah, Seattle, Wash., and Billings, Mont., all departures at every level

turned away from normal with a clockwise rotation. Medford, Oreg., exhibited the largest tendency to depart widely from its normal directions at all levels.

Charts VIII and IX show resultant wind directions at 1.5 and 3 kilometers, respectively, based on 5 a. m. observations, while table 2 shows those based on 5 p. m. observations. Of all the 5 a. m. winds shown on these charts, 54 percent were northwesterly and 37 percent southwesterly at 1.5 kilometers; and 89 percent northwesterly and 11 percent southwesterly at 3 kilometers. But, of all the 5 p. m. wind resultants, as shown in table 2, 47 percent were northwesterly and 53 percent southwesterly at 1.5 kilometers, and 65 percent northwesterly and 35 percent southwesterly, at 3 kilometers. At 4 and 5 kilometers 70 percent of the directions were northwesterly and 30 percent southwesterly, respectively, while at 8 kilometers all wind directions had northwesterly components.

Resultant wind velocities, when compared to existing 5 a. m. normals, indicated that large departures from normal did not occur along with large directional departures, except at Houston, Tex., Oakland, Calif., and San Diego, Calif. In all cases, where the current velocity departures were greater than 3 meters per second, the differences were positive, or greater than normal, being as much as +15.4 m. p. s. over Brooklyn, N. Y., at 4 kilometers; +13.2 m. p. s. at Oakland, Calif.; +16.7 m. p. s. over Houston, Tex.; +12.5 m. p. s. over Oklahoma City, Okla.; and +12.3 m. p. s. over Omaha, Nebr.; all at 5 kilometers. The maximum resultant wind speed for the month was 36.5 m. p. s. (81.6 miles per hour) over Albuquerque, N. Mex., at 10 kilometers.

The highest resultant wind velocities were confined mostly to the eastern portion of the United States, particularly at 4 and 5 kilometers. At 1.5 kilometers the highest velocities occurred over the Ohio Valley, Great Lakes region, the northeastern States and New Brunswick. Relatively high wind speeds existed along the Pacific coast, upper Missouri Valley and northern Rocky Mountain region, as well as Cuba. At 3 kilometers the highest velocities were centered over the Middle Atlantic States, Ohio Valley, and lower Lake region, as well as the central Pacific coast areas. The lowest velocities occurred in the far South (southern Florida and Cuba). At 4 kilometers the highest velocities were found over the Ohio Valley, the northeastern States and the entire Pacific coast, while lower velocities occurred over the central Rocky Mountain region, Florida and Cuba. But, at 5 kilometers, the area of greatest velocities covered most of the country, particularly the lower Mississippi and Ohio Valleys, and the west Gulf States. Considerably lower resultant velocities were noted over the central Rocky Mountain region and portions of the upper Missouri Valley, as well as Florida and Cuba.

Maximum free-air wind velocities for February are given in table 3. A wind speed of 49 meters per second (109.6 miles per hour) was recorded over Sandberg, Calif., at 2.5 kilometers; 62 m. p. s. (138.6 miles per hour) over Harrisburg, Pa., at 3.6 kilometers; and 91 m. p. s. (203.6 miles per hour) over Las Vegas, Nev., at 9.4 kilometers. This latter wind speed was the second highest to be recorded in the United States, being surpassed only by the record of 95.5 m. p. s. (213.6 miles per hour) established over Albuquerque, N. Mex., in January 1939, and nearly equalled by 90 m. p. s. (201.3 miles per hour), observed in November 1938, over Winslow, Ariz., at 12 kilometers.

The mean insentropic chart [1] for February is characterized by three anticyclonic moist eddies. The two moist eddies, one of which enters on the Texas coast and extends to Sault Ste. Marie, the other extending east of the Appalachians to northern New York, seem to correspond to large positive departures of precipitation from normal west of the Mississippi to Iowa, along the Appalachians and the eastern seaboard to the Great Lakes and New England. The third moist eddy enters near Portland, Oreg., and does not seem to correspond to any significant departures of precipitation from normal, although a band of slight precipitation excess follows the center of moisture closely.

This chart differs from those for February 1935, 1936, and 1937, which show dry downslope winds in the eastern part of the country and have the main source of moisture in the southern plateau region; a corresponding difference in precipitation distribution is present. A further difference is in the winds which for the 1939 chart show more of a northerly component on the Pacific coast and more southerly on the Atlantic coast than in the other three Februarys.

[1] This chart and the following discussion have been prepared by the Air Mass Section of the Meteorological Research Division.

TABLE 1.—*Mean free-air barometric pressures (P.) in mb, temperatures (T.) in °C, and relative humidities (R. H.) in percent obtained by airplanes during February 1939*

Stations and elevations in meters above sea level	Altitude (meters) m. s. l.																										
	Surface				500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of observations	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.	P.	T.	R. H.
Billings, Mont. (1,090 m.)	26	889	−9.0	71							843	−7.2	65	790	−9.2	65	740	−11.1	66	693	−14.1	68	607	−20.5	67	528	−27.6	66
Cheyenne, Wyo. (1,873 m.)	28	805	−10.0	68										792	−8.1	64	742	−9.2	61	696	−12.0	59	610	−18.0	55	532	−25.2	53
Chicago, Ill. (187 m.)	28	994	−5.0	82	955	−5.9	81	897	−5.9	71	842	−6.0	61	789	−7.5	57	740	−9.4	55	693	−11.6	56	607	−16.8	56	531	−22.4	54
Coco Solo, C. Z.[1] (15 m.)	28	1,012	24.9	81	957	21.3	91	904	18.2	90	852	15.2	83	803	12.9	73	756	12.5	44	713	10.9	27	631	5.7	17	558	.3	13
El Paso, Tex. (1,193 m.)	28	880	2.0	44							848	4.9	40	797	1.9	39	749	−.9	38	703	−3.7	34	618	−9.2	33	543	−15.2	26
Lakehurst, N. J.[1] (39 m.)	23	1,018	−.3	77	961	.7	66	903	−.5	58	849	−1.5	52	797	−3.3	52	748	−5.7	51	702	−8.4	50	616	−14.0	48	539	−19.6	48
Norfolk, Va.[1] (10 m.)	15	1,025	2.8	73	964	4.0	48	907	2.3	41	852	.2	36	800	−1.0	33	752	−3.0	33	706	−5.4	31	620	−10.7	27	544	−16.2	31
Pearl Harbor, T. H.[1] (6 m.)	28	1,016	20.6	84	960	20.3	73	906	17.4	77	854	14.7	76	804	13.1	64	758	11.3	52	714	9.0	46	631	3.8	40	558	−.6	32
Pensacola, Fla.[1] (13 m.)	17	1,021	9.8	84	964	10.2	70	907	9.9	59	854	8.7	49	804	7.3	42	756	5.2	35	710	2.4	31	627	−2.6	21	552	−7.6	25
St. Thomas, V. I.[1] * (8 m.)																											
Salt Lake City, Utah (1,288 m.)	28	872	−6.4	84							848	−4.1	73	796	−6.4	69	746	−9.6	74	699	−13.0	78	613	−18.2	73	535	−24.8	63
San Diego, Calif.[1] (10 m.)	26	1,019	6.9	80	960	8.3	73	904	6.1	68	850	3.9	63	800	1.7	58	751	−.3	52	705	−2.6	48	621	−7.3	44	546	−14.1	42
Seattle, Wash.[1] (10 m.)	18	1,020	3.9	81	960	1.1	80	902	−2.0	80	847	−4.7	71	794	−7.8	66	744	−10.3	64	697	−12.1	54	610	−17.9	49	534	−25.0	67
Spokane, Wash. (597 m.)	25	946	−3.5	80				900	−3.5	72	844	−5.9	70	792	−8.5	70	742	−11.3	69	695	−14.3	67	608	−20.4	64	530	−26.7	63

* Flights discontinued temporarily.
Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.
[1] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb, temperctures (T.) in °C., and relative humidities (R. H.) in percent obtained by radiosonde during February 1939*

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Fargo, N. Dak. (274 m.)				Nashville, Tenn. (180 m.)				Oakland, Calif. (2 m.)				Oklahoma City, (391 m.)				Omaha, Nebr. (300 m.)				Sault Ste. Marie, Mich. (221 m.)				Washington, D. C. (13 m.)[1]			
	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.	Number of Observations	P.	T.	R. H.
Surface	28	984	−19.8	90	28	997	4.8	81	28	1,021	6.4	81	28	970	−0.8	71	28	981	−8.6	75	28	988	−12.5	91	25	1,020	3.1	74
500	28	955	−17.2	90	28	959	4.9	76	28	961	6.4	76	28	957	−.4	71	28	957	−8.7	67	28	952	−12.8	94	25	960	2.2	67
1,000	28	894	−14.4	89	28	902	3.7	72	28	905	4.3	70	28	900	1.1	65	28	896	−7.8	58	28	892	−13.4	94	25	903	1.2	66
1,500	28	836	−13.7	86	28	848	2.6	64	28	850	2.1	64	28	846	1.5	59	28	841	−7.4	54	28	835	−13.7	91	25	848	0.0	67
2,000	28	783	−14.6	83	28	797	.8	62	28	799	−.2	60	28	794	−.5	53	28	788	−9.0	54	28	782	−14.0	87	25	797	−1.4	65
2,500	28	733	−16.2	80	28	748	−1.2	59	28	750	−2.5	57	28	746	−2.7	48	28	739	−11.2	54	28	732	−15.6	83	25	748	−3.2	62
3,000	28	685	−18.3	78	28	702	−3.3	59	28	704	−5.3	55	28	700	−5.5	46	28	692	−13.3	54	28	685	−17.8	79	25	702	−5.4	58
4,000	28	599	−23.5	77	28	619	−7.8	51	27	619	−10.6	49	28	616	−10.7	44	27	606	−18.8	54	28	598	−23.1	75	25	617	−10.7	54
5,000	28	521	−29.6	77	28	544	−13.4	48	27	543	−16.5	49	28	540	−16.8	42	26	530	−24.9	54	28	521	−28.4	71	25	541	−16.3	49
6,000	28	452	−36.1	75	28	476	−19.5	47	26	474	−22.7	49	28	472	−24.2	41	25	461	−31.3	52	27	453	−34.2	69	25	473	−22.0	48
7,000	28	391	−43.2	..	28	415	−26.1	47	25	413	−29.1	47	27	411	−31.0	39	24	400	−37.5	50	27	391	−40.9	67	24	412	−28.2	48
8,000	28	336	−50.7	....	28	361	−32.8	46	25	359	−36.2	46	26	356	−37.6	39	24	345	−44.3	....	28	337	−47.7	....	24	358	−34.6	....
9,000	28	288	−55.4	....	28	313	−39.5	45	24	310	−43.7	45	25	307	−43.9	....	24	296	−49.2	....	22	289	−52.1	....	21	309	−41.2	....
10,000	28	246	−56.9	....	28	269	−47.1	....	22	266	−50.3	....	25	264	−49.5	....	23	254	−52.5	....	19	247	−53.0	....	18	266	−48.3	....
11,000	26	210	−55.9	....	24	231	−53.6	....	21	228	−56.2	....	20	226	−54.2	....	23	218	−53.8	....	17	212	−52.6	....	17	228	−54.5	....
12,000	23	179	−54.9	....	21	197	−58.7	....	18	195	−61.3	....	16	194	−56.0	....	22	186	−54.5	....	15	181	−52.2	....	15	195	−57.7	....
13,000	21	153	−54.3	....	19	168	−60.3	....	16	165	−63.4	....	9	166	−58.0	....	19	159	−55.1	....	13	155	−52.1	....	15	167	−60.2	....
14,000	19	131	−54.5	....	17	142	−61.9	....	14	140	−62.2	....	.....	.....	.....	.....	16	136	−55.9	....	11	133	−52.7	....	10	142	−60.6	....
15,000	17	112	−55.5	....	15	121	−64.8	....	11	119	−63.2	....	.....	.....	.....	.....	15	116	−57.0	....	8	114	−53.4	....	8	121	−62.8	....
16,000	12	96	−56.6	....	13	102	−66.0	....	8	100	−65.4	....	.....	.....	.....	.....	10	99	−57.8	....	5	96	−54.9	....	6	103	−65.4	....
17,000	.....	.....	.....	.....	9	86	−67.3	....	7	85	−67.3	....	.....	.....	.....	.....	9	84	−59.2	....	.....	.....	.....	.....	5	87	−68.3	....
18,000	.....	.....	.....	.....	.....	.....	.....	.....	5	71	−67.8	....	.....	.....	.....	.....	6	71	−59.2	....	.....	.....	.....	.....	.....	.....	.....	.....

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.

[1] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels, also the humidity data are missing for some observations at certain levels, also the humidity data are not used in daily observations when the temperature is below −40° C.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during February 1939*

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second (superior figures indicate number of observations)]

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)		Albuquerque, N. Mex. (1,554 m.)		Atlanta, Ga. (302 m.)		Billings, Mont. (1,095 m.)		Boise, Idaho (850 m.)		Brooklyn, N. Y. (15 m.)		Brownsville, Tex. (7 m.)		Buffalo, N. Y. (220 m.)		Burlington, Vt. (132 m.)		Charleston, S. C. (18 m.)		Cheyenne, Wyo. (1,873 m.)		Chicago, Ill. (192 m.)		Cincinnati, Ohio (157 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	212	1.6[37]	287	1.7[28]	215	1.7[26]	262	2.4[25]	317	1.5[30]	268	3.3[32]	124	1.9[24]	247	4.6[37]	199	2.5[34]	177	1.0[29]	298	4.7[23]	244	2.5[29]	250	3.0[29]
500	.....	.....	.....	.....	213	1.8[26]	.....	.....	.....	.....	271	5.9[32]	131	1.8[24]	239	8.3[37]	210	6.2[29]	203	5.7[27]	.....	.....	231	4.6[37]	238	6.0[34]
1,000	241	3.3[37]	.....	.....	244	3.7[24]	.....	.....	322	1.9[33]	272	9.1[31]	154	1.3[33]	243	12.2[29]	251	8.6[30]	221	7.4[24]	.....	.....	247	7.7[33]	227	7.3[31]
1,500	235	5.3[33]	.....	.....	251	7.0[32]	262	5.5[31]	305	4.1[33]	268	14.3[19]	285	2.1[30]	252	12.6[18]	276	11.8[17]	233	10.5[31]	.....	.....	270	11.3[19]	246	11.5[19]
2,000	254	8.1[30]	271	3.1[28]	256	11.5[31]	282	7.6[27]	302	6.7[33]	276	17.7[17]	264	6.4[16]	259	13.3[19]	278	15.4[18]	245	12.8[17]	295	5.6[30]	269	14.5[16]	250	14.5[17]
2,500	253	11.1[30]	268	4.6[33]	261	13.7[18]	287	8.7[26]	303	8.0[32]	274	19.8[18]	241	10.5[12]	.....	.....	298	17.4[19]	269	11.9[11]	292	7.4[33]	271	16.8[13]	265	14.9[13]
3,000	251	15.3[30]	275	8.0[37]	265	15.5[13]	289	10.7[32]	318	9.6[17]	272	19.3[12]	248	10.9[11]	.....	.....	.....	.....	268	14.7[11]	285	9.8[31]	275	18.2[13]	268	19.3[10]
4,000	254	21.3[30]	278	14.6[28]	265	17.0[10]	296	13.1[14]	342	14.8[13]	265	24.9[10]	.....	.....	.....	.....	.....	.....	.....	.....	293	11.6[13]	.....	.....	.....	.....
5,000	260	26.2[16]	271	20.9[24]	.....	.....	314	16.4[11]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	290	10.8[13]	.....	.....	.....	.....
6,000	258	33.3[13]	273	25.8[13]	.....	.....	311	16.0[11]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	284	12.9[13]	.....	.....	.....	.....
8,000	.....	.....	271	34.6[16]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,000	.....	.....	270	36.5[10]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)		Fargo, N. Dak. (283 m.)		Greensboro, N. C. (271 m.)		Havre, Mont. (766 m.)		Houston, Tex. (21 m.)		Huron, S. Dak. (393 m.)		Las Vegas, Nev. (570 m.)		Little Rock, Ark. (— m.)		Medford, Oreg. (410 m.)		Miami, Fla. (10 m.)		Minneapolis, Minn. (261 m.)		Nashville, Tenn. (194 m.)		New Orleans, La. (19 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	266	4.6[33]	328	4.0[33]	244	2.0[24]	282	1.8[33]	109	1.8[37]	320	3.4[37]	13	2.8[37]	.....	.....	316	1.7[29]	127	4.6[30]	264	2.2[37]	200	2.1[33]	142	2.0[26]
500	.....	.....	305	3.3[32]	223	4.0[24]	.....	.....	153	3.4[26]	318	4.0[37]	.....	.....	.....	.....	311	1.7[33]	133	4.7[28]	265	3.7[37]	203	3.8[33]	177	5.0[26]
1,000	.....	.....	303	5.7[31]	227	7.0[24]	270	4.0[33]	183	1.4[30]	300	5.0[33]	5	2.6[37]	.....	.....	294	2.2[33]	153	3.6[24]	282	6.8[33]	207	5.9[33]	192	5.6[33]
1,500	272	4.2[33]	306	8.7[31]	251	10.2[33]	284	8.2[33]	284	4.8[17]	289	6.6[30]	329	2.6[37]	.....	.....	285	3.2[33]	195	2.9[33]	291	9.9[31]	226	8.7[31]	231	6.4[19]
2,000	263	4.8[33]	299	11.3[30]	256	12.9[33]	294	11.5[34]	264	8.1[14]	288	9.2[16]	310	5.2[37]	.....	.....	312	4.4[31]	221	3.4[19]	285	13.2[16]	245	11.0[17]	254	8.4[14]
2,500	260	7.2[26]	295	11.6[17]	261	16.3[17]	298	11.9[33]	260	10.9[14]	291	10.7[16]	312	8.1[34]	.....	.....	335	8.5[17]	244	3.8[11]	286	11.8[17]	255	13.4[16]	257	11.0[13]
3,000	261	11.8[33]	296	13.0[17]	268	18.8[13]	297	10.5[16]	266	15.6[11]	289	10.9[17]	319	8.9[33]	.....	.....	343	10.0[13]	.....	.....	285	12.2[16]	259	15.5[14]	.....	.....
4,000	261	17.6[33]	288	17.6[13]	267	21.4[10]	.....	.....	264	19.3[11]	283	13.0[13]	317	13.4[31]	.....	.....	.....	.....	.....	.....	284	14.0[14]	274	21.2[11]	.....	.....
5,000	264	21.6[33]	289	17.8[13]	.....	.....	.....	.....	264	24.7[10]	285	15.6[14]	320	17.1[13]	.....	.....	.....	.....	.....	.....	280	12.4[13]	.....	.....	.....	.....
6,000	259	27.9[17]	284	19.0[13]	.....	.....	.....	.....	.....	.....	288	16.3[13]	320	22.6[16]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8,000	.....	.....	274	19.9[10]	.....	.....	.....	.....	.....	.....	282	17.2[10]	314	27.8[13]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	278	18.3[10]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during February 1939*—Continued

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)		Oklahoma City, Okla. (402 m.)		Omaha, Nebr. (306 m.)		Reno, Nev. (1,346 m.)		St. Louis, Mo. (170 m.)		Salt Lake City, Utah (1,294 m.)		San Diego, Calif. (15 m.)		San Juan, P. R. (16 m.)		Sault Ste. Marie, Mich. (198 m.)		Seattle, Wash. (14 m.)		Spokane, Wash. (603 m.)		Washington, D. C. (10 m.)		Winslow, Ariz. (1,488 m.)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	281	3.2[21]	283	1.5[33]	308	3.1[18]	360	1.0[35]	225	0.9[36]	226	2.1[18]	286	3.6[37]	67	6.7[30]	274	3.9[19]	195	1.5[34]	209	1.5[30]	263	1.5[34]	263	2.6[25]
500	333	3.6[25]	272	1.6[26]	306	3.9[29]			230	2.5[30]			304	2.7[27]	82	8.8[29]	280	5.2[19]	210	2.9[34]			240	3.6[26]		
1,000	352	5.0[24]	236	2.4[35]	299	4.4[27]			232	5.7[32]			340	3.5[33]	91	7.8[27]	286	5.2[19]	236	3.5[27]	219	2.8[36]	239	6.1[32]		
1,500	350	8.2[21]	236	6.2[26]	288	7.7[24]	338	1.5[39]	245	9.0[28]	215	2.7[28]	341	5.3[33]	93	7.6[24]	294	8.6[13]	256	3.8[14]	249	4.4[24]	263	10.0[26]		
2,000	355	9.2[20]	257	9.6[23]	276	10.6[23]	300	2.7[36]	256	11.8[14]	233	2.2[31]	324	5.8[23]	92	6.7[17]	297	9.9[13]	286	6.0[10]	278	5.7[19]	270	13.2[26]	264	3.5[37]
2,500	357	10.2[19]	258	11.6[23]	279	12.7[20]	307	4.7[37]	273	13.4[13]	267	3.2[25]	323	8.4[23]	91	6.5[13]	288	11.7[12]			296	6.4[17]	272	15.8[19]	269	5.4[37]
3,000	350	14.0[18]	252	14.2[21]	270	14.5[19]	327	7.2[33]	277	15.6[18]	284	4.7[28]	331	11.1[20]	84	6.4[13]					312	8.7[15]	282	17.7[12]	273	6.4[37]
4,000	343	18.0[13]	261	17.9[17]	277	18.5[19]	346	15.2[15]			321	8.8[11]	317	11.5[16]							315	12.9[13]			285	10.9[34]
5,000			259	25.5[16]	274	22.7[13]	339	19.6[13]					314	15.2[14]							322	15.9[10]			292	14.7[30]
6,000			259	30.0[13]	272	25.8[13]	339	24.0[13]																	292	18.1[19]
8,000																									294	25.6[17]
10,000																									288	27.2[13]

TABLE 3.—*Maximum free-air wind velocities (M. P. S.) for different sections of the United States based on pilot-balloon observations during February 1939*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) M. S. L.	Date	Station	Maximum velocity	Direction	Altitude (m.) M. S. L.	Date	Station	Maximum velocity	Direction	Altitude (m.) M. S. L.	Date	Station
Northeast [1]	46.4	WNW	2,260	11	Brooklyn, N. Y.	62.0	WSW	3,620	20	Harrisburg, Pa.	61.0	W	9,880	13	Cleveland, Ohio.
East-Central [2]	45.4	SSW	1,830	2	Knoxville, Tenn.	45.6	W	5,000	11	Nashville, Tenn.	58.0	W	8,670	12	Knoxville, Tenn.
Southeast [3]	40.0	NW	2,500	7	Spartanburg, S. C.	50.0	W	4,300	22	Spartanburg, S. C.	45.4	WSW	5,870	4	Charleston, S. C.
North-Central [4]	43.5	WSW	1,550	10	Detroit, Mich.	46.8	WNW	4,650	17	Fargo, N. Dak.	57.0	WSW	10,640	18	Huron, S. Dak.
Central [5]	46.8	WSW	1,960	19	Wichita, Kans.	54.0	WSW	4,680	1	Omaha, Nebr.	72.0	WSW	9,560	11	Wichita, Kans.
South-Central [6]	41.0	SSW	1,390	16	Oklahoma City, Okla.	53.2	NNW	3,280	2	Del Rio, Tex.	71.0	SW	7,710	5	Abilene, Tex.
Northwest [7]	36.1	W	1,760	18	Havre, Mont.	39.6	NNW	3,820	15	Boise, Idaho	65.5	NNE	9,670	16	Billings, Mont.
West-Central [8]	35.2	NW	2,290	1	Cheyenne, Wyo.	47.8	NW	4,270	15	Redding, Calif.	86.0	ENE	17,760	17	Denver, Colo.
Southwest [9]	49.0	NNW	2,500	26	Sandberg, Calif.	59.1	NNW	2,750	26	Sandberg, Calif.	91.0	N	9,420	13	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during February 1939, classified according to the potential temperatures (10-degree intervals between 290 and 399° A.) with which they are identified. (Based on radiosonde observations.) All actual temperatures are in degrees centigrade below zero*

Potential temperatures °A.	Fargo, N. Dak.			Nashville, Tenn.			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.			Sault Ste. Marie, Mich.			Washington, D. C.		
	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature	Number of cases	Mean altitude	Mean temperature
290–299	10	6.6	44.4				1	5.3	33.0	1	7.4	44.0	3	6.1	35.3	12	6.2	41.0			
300–309	25	8.5	55.2	1	7.4	47.0	3	7.4	43.0	4	7.4	42.2	13	7.8	46.5	21	7.7	48.4	1	7.1	45.0
310–319	10	9.6	59.5	3	7.8	35.7	7	8.8	46.8	10	8.5	44.6	14	9.2	53.0	9	8.7	51.9	4	8.4	39.2
320–329	6	10.2	58.3	17	9.7	47.6	12	10.4	61.1	13	10.2	52.9	15	10.0	53.7	12	10.1	57.1	7	11.1	60.4
330–339	2	11.2	62.5	12	11.6	59.2	9	12.0	63.1	6	11.3	58.8	6	10.7	54.2	1	11.5	61.0	8	11.4	59.1
340–349				13	12.3	60.2	5	13.3	69.2	3	11.4	54.7	6	11.5	57.7				1	13.0	65.0
350–359	1	12.4	62.0	1	12.8	60.0				1	12.4	55.0	1	11.5	52.0	5	11.7	53.6			
360–369	1	12.3	55.0	1	14.0	64.0							6	12.8	56.8	1	12.5	54.0	3	13.2	57.3
370–379	2	13.4	53.5	2	14.9	68.0	1	13.7	59.0				2	13.8	60.0	3	13.3	56.3	1	13.7	58.0
380–389				4	15.7	68.2	1	15.1	65.0	2	14.5	61.5	4	13.9	58.0						
390–399	1	14.3	54.0										3	15.0	56.7						
All (weighted mean)		9.3	54.7		11.4	55.4		10.8	58.0		10.0	51.0		10.3	52.8		8.7	50.2		11.0	55.7
Mean potential temperature, °A.		313.3			338.6			329.0			326.8			331.7			316.3			333.5	

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in charge]

NOTE.—The report for February will be published in the March REVIEW.—*Editor.*

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in charge]

NORTH ATLANTIC OCEAN, FEBRUARY 1939

By H. C. HUNTER

Atmospheric pressure.—The northernmost regions, particularly the northeastern, had pressure averaging considerably below normal, but with several rapid changes between high and low readings. At Reykjavik, Iceland, the deficiency of the monthly average was almost a third of an inch, and the highest reading of the month was but 30.00 inches. Over these regions pressure was generally low from the 3d to the 7th and again from the 20th to the end of the month.

Substantially all other parts of the North Atlantic had pressure above normal, especially the area from the Gulf of St. Lawrence southward and southeastward to the 30th parallel of latitude and the areas adjacent to or between the Iberian Peninsula and Madeira. At Horta decidedly low pressure during the first 10 days was followed by high pressure which was almost constant thereafter till the final day of the month.

The extremes of pressure noted in available vessel reports are 30.91 and 27.90 inches. The higher mark was recorded on the American steamship *Eriria*, late on the forenoon of the 12th, near 39° N., 20° W. The low reading was reported by the Dutch liner *Noordam* as made at midnight of the 8–9th, at about 46° N., 37° W., when the vessel encountered the most notable Atlantic cyclone of the month.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, February 1939*

Station	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.34	−0.19	30.20	27	28.62	23
Reykjavik, Iceland	29.22	−.32	30.00	1, 13	28.59	21
Lerwick, Shetland Islands	29.60	−.12	30.21	1	29.12	25, 26
Valencia, Ireland	29.95	+.05	30.59	14	29.03	28
Lisbon, Portugal	30.22	+.12	30.56	11	29.53	1
Madeira	[1] 30.24	+.17	30.45	12	29.80	1
Horta, Azores	30.24	+.09	30.64	16, 17	29.58	5
Belle Isle, Newfoundland	29.83	+.12	30.48	14	29.12	23
Halifax, Nova Scotia	30.08	+.17	30.58	10	29.46	16
Nantucket	30.08	+.04	30.65	17	29.44	22
Hatteras	30.16	+.05	30.59	17	29.54	6
Bermuda	30.25	+.13	30.42	9	29.82	7
Turks Island	30.09	+.01	30.16	13, 17	29.98	23
Key West	30.09	+.02	30.29	12	29.95	3
New Orleans	30.08	−.01	30.59	22	29.66	3

[1] For 22 days.

NOTE.—All data based on a. m. observations only, with departures compiled from vest available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—The month was distinctly less turbulent than January just before it had been, yet the first half was a period of considerable storminess. From the beginning of the month until about the 11th one or more deep centers of low pressure were nearly always to be found in higher latitudes, chiefly to eastward of the 45th meridian, and reports of violent gales were numerous. On the 5th the American liner *President Roosevelt* encountered winds of hurricane force (12) near midocean, in latitude about 47°.

For the ocean as a whole the most important LOW of February was first noted as a weak center close to Hatteras on the morning of the 6th. On the following morning it was southeast of Cape Cod with much greater strength, and on the 8th it was near 44° N., 42° W., showing signs of uniting with another LOW to the northeastward. Developments came rapidly in the next few hours. On the morning of the 9th one center with pressure about 28 inches appeared on the chart near 48° N., 36° W., and a large area was under the influence of intense winds. This deep center then moved toward the north-northeast, its progress becoming rapid by the evening of the 10th, and soon the chief steamship lanes were free from its influence.

Within the area swept by the intense gales of this LOW, the British freight steamer *Maria de Larrinaga*, from Houston for the British Isles, sank with all hands during the night of the 8–9th, the position given in her call for aid being about 42° N., 47° W. Several vessels reported more or less structural damage from their encounter with this storm; also several were so delayed and expended so much fuel that they left their courses to make port for replenishing their supplies. The Belgian steamship *Gand* and the American *Sundance* reported winds of force 12 during the night of the 7–8th, when they were within the western semicircle of this storm.

There was one later instance of force-12 winds this month, reported by the German motorship *Kattegat*, westbound, in latitude 31° N., longitude 47° W., on the evening of the 10th.

About the middle of the month, and again about the 22d, waters close to the American coast were swept by storms which advanced so nearly northward that most portions of the North Atlantic were unaffected. Charts XIII and XIV show the conditions on the 16th and the 22d, respectively. The center of the earlier of these LOWS was over Pennsylvania on the morning of the 15th, thence moved to southern Labrador and on the 17th was near southern Greenland. A squall probably connected with this LOW disabled a small trawler off Cape Henry, and necessitated its being towed to port.

The second of these western cyclones was centered over Chesapeake Bay on the evening of the 21st, with only moderate strength, but was much stronger the next morning when east of Cape Cod. The following morning found it near the east coast of Labrador, whence it traveled on to southeastern Greenland in the next 24 hours.

Fog.—While fog was not very prevalent, yet substantially all portions of the North Atlantic to northward of 40° latitude, as well as portions just east of the United States coast had more than during January just preceding.

From the 60th meridian eastward to the eastern limits of the Grand Banks there was less fog than normal in February, and indeed before the 21st there was scarcely any. In midocean fog was almost completely absent, but

from the region of the Azores to the coasts of the British Isles and France a little fog was met, chiefly during the first 12 days. No single 5° square in the areas from 60° eastward had fog on more than 4 days.

Near the American coast from Nova Scotia to Hatteras there was about as much fog as in the average February, and the occurrences were well scattered through the month. However, one square here, 35° to 40° N., 70° to 75° W., went far beyond the average amount, having fog on 11 days, so that it surpassed all other North Atlantic areas in fog frequency.

From Hatteras to the southern tip of Florida, fog was, as usual, very infrequent. In the northern Gulf of Mexico there generally was more than the February normal amount. The northwestern portion, 25° to 30° N., 90° to 95° W., led other Gulf areas, having 7 foggy days, all during the first half of the month; but this was less fog than had occurred there during January.

Several mishaps in American waters are laid to the fog. During the 2d and 3d, three collisions occurred in New York harbor and the Delaware River. Late on the 26th the American freight steamer *Lillian* was greatly damaged in collision off the coast of New Jersey, and sank about 18 hours later, without loss of life.

The American tanker *Lightburne* grounded off Block Island during fog on the evening of the 9th. All hands were saved and even part of the cargo, but the vessel itself will be almost surely a total loss.

OCEAN GALES AND STORMS, FEBRUARY 1939

Vessel	Voyage		Position at time of lowest barometer		Gale began February	Time of lowest barometer, February	Gale ended February	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Silverteak, Br. M. S.	Dakar	Halifax	35 26 N.	56 29 W.	[1] 31	Noon, 1	2	29.72	SW.	WNW, 10.	NNW.	WNW, 10.	W-NW.
Exeter, Am. S. S.	New York	Gibraltar	39 54 N.	38 00 W.	1	9p, 1	2	29.44	SW.	SW, 8.	SW.	SW, 9.	
Oakwood, Am. S.	Beaumont	Havre	[2]32 59 N.	49 19 W.	2	1a, 2	3	29.98	W.	W, 7	NW.	NW, 10.	SW-WNW.
W. S. Rheem, Am. S. S.	Ostermoor	Cristobal	34 18 N.	36 50 W.	2	4a, 3	3	29.77	SW.	SW, 8.	WNW.	WNW, 10.	SW-WNW.
Belgian Gulf, Belg. M. S.	Port Arthur	London	44 08 N.	26 50 W.	3	10p, 3	4	29.46	SSW.	S, 10.	SSW.	S, 10.	S-SW.
Exmoor, Am. S. S.	New York	Casablanca	36 55 N.	46 37 W.	3	2a, 5	6	29.42	WSW.	SW, 10.	W.	SW, 10.	WSW-SW.
Washington, Am. S. S.	Cobh	New York	47 58 N.	39 25 W.	5	4p, 5	6	28.10	E.	Var., 6	WNW.	NW, 10.	ENE-Var-NNW.
Pres. Roosevelt, Am. S. S.	New York	Cobh	46 50 N.	37 50 W.	5	6p, 5	6	28.10	SW.	W, 10.	SW.	W, 12.	SSW-WNW.
Schuylkill, Br. M. S.	Plymouth	Cristobal	40 10 N.	29 12 W.	5	7p, 5	6	29.35	S.	SW, 9.	W.	SW, 10.	SSW-W.
Exiria, Am. S. S.	New York	Gibraltar	39 20 N.	45 00 W.	7	6p, 7	9	28.96	S.	S, 7	WSW.	W, 10.	S-SW.
Gand, Belg. S. S.	New Orleans	Havre	[2]40 06 N.	57 08 W.	7	9p, 7	9	28.81	E.	N, 12	NNW.	N, 12.	SW-N.
Sundance, Am. S. S.	Charleston	Avonmouth	41 18 N.	55 30 W.	7	10p, 7	9	28.59	E.	NNE, 12	NW.	NNE, 12.	E-N.
Express, Am. S. S.	Gibraltar	New York	35 21 N.	47 55 W.	7	3a, 8	8	29.29	SW.	SW, 10	NW.	WNW, 10.	S-WNW.
Tabian, Du. M. S.	Sabang	Halifax	33 54 N.	45 40 W.	8	9a, 8	9	29.46	SW.	WSW, 9	NW.	W, 10.	SW-W.
Barendreebt, Du. M. S.	Cristobal	Rotterdam	[2]35 54 N.	38 47 W.	8	3p, 8	8	29.44	SW.	W, 8	W.	SW, 10.	SW-W.
Europe, Nor. M. S.	Port Arthur	Liverpool	41 44 N.	37 12 W.	7	6p, 8	10	28.72	SSW.	SSW, 11	SSW.	SSW, 11.	SSW-WSW.
Atlanta City, Am. S. S.	Gibraltar	New York	35 11 N.	35 53 W.	8	7p, 8	10	29.57	SW.	SSW, 10	W.	SSW, 10.	SSW-W.
American Trader, Am. S. S.	New York	Plymouth	46 00 N.	39 18 W.	8	10p, 8	10	28.40	E.	SSE, 3	SSW.	SW, 11.	SSW-Var-WSW.
Noordam, Du. M. S.	do	Rotterdam	46 21 N.	36 47 W.	8	Mdt, 8	9	27.90	ENE.	SSW, 8	S.	SW, 9.	SSE-SW.
American Farmer, Am. S. S.	London	Boston	48 10 N.	33 56 W.	9	4a, 9	9	28.33	S.	S, 8	SSW.	SSW, 11.	ESE-S-SSW.
Zaandam, Du. M. S.	Rotterdam	New York	47 28 N.	37 27 W.	7	4a, 9	10	28.12	SSW.	SSE, 3	NNW.	NW, 10.	SSE-NW.
Scanmail, Am. S. S.	New York	Gothenburg	42 18 N.	46 48 W.	9	Noon, 9	10	29.49	W.	NNW, 9	N.	NW, 10.	NNW-WNW.
Black Condor, Am. S. S.	Chester, Pa	Rotterdam	40 20 N.	65 25 W.	9	2p, 9	10	30.19	WSW.	NW, 7	N.	NNW, 9.	WSW-NNW.
Gand, Belg. S. S.	New Orleans	Havre	[1]41 28 N.	51 36 W.	10	4a, 10	11	29.89	NNE.	NNE, 7	NNE.	NNE, 9.	
Tabian, Du. M. S.	Sabang	Halifax	37 10 N.	50 14 W.	10	6a, 10	10	29.45	WNW.	WNW, 9	N.	WNW, 9.	WNW-NNE.
Express, Am. S. S.	Gibraltar	New York	35 02 N.	52 36 W.	10	8a, 10	10	29.76	WNW.	NW, 10	N.	NW, 10.	WNW-NNW.
Zarembo, Am. S. S.	New York	Dakar	30 54 N.	44 42 W.	10	4p, 10	10	29.58	WSW.	WNW, 9	WNW.	WNW, 10.	NW-SW-NW.
Schuylkill, Br. M. S.	Plymouth	Cristobal	31 00 N.	42 30 W.	10	5p, 10	11	29.59	SW.	W, 8	NW.	NW, 10.	SW-WNW.
Kattegat, Ger. M. S.	Rotterdam	Baytown	31 14 N.	46 50 W.	10	7p, 10	11	[3]29.49	W.	NW, 11	NNW.	NNE, 12.	WNW-NNE.
Atlanta City, Am. S. S.	Gibraltar	New York	35 30 N.	42 20 W.	11	2a, 11	12	29.10	NNE.	N, 4	NE.	N, 9	W-NE.
Steel Seafarer, Am. S. S.	do	Boston	35 10 N.	39 54 W.	10	4p, 11	11	29.41	S.	S, 8	S.	S, 10	
Baarn, Du. S. S.	Curacao	Liverpool	35 30 N.	44 48 W.	10	4p, 11	11	29.22	NNW.	N, 9	NNE.	NNW, 10.	NNW-NNE.
Exiria, Am. S. S.	New York	Gibraltar	37 36 N.	12 00 W.	13	5p, 13	13	30.29	NNE.	NNE, 7		NNE, 9.	
American Shipper, Am. S. S.	Belfast	Boston	54 32 N.	22 09 W.	14	8p, 14	15	29.74	SSW.	SSW, 7	W.	W, 11.	SSW-SW.
Scanmail, Am. S. S.	New York	Gothenburg	58 08 N.	12 11 W.	15	5p, 15	16	29.41	SW.	W, 8	W.	WSW, 9.	WSW-W.
American Shipper, Am. S. S.	Belfast	Boston	53 37 N.	28 51 W.	16	4p, 16	17	29.88	SW.	SW, 9	WSW.	SW, 9.	SW-WSW.
Do	do	do	50 10 N.	42 22 W.	19	4p, 19	20	29.18	SSW.	SW, 11	WNW.	SW, 11.	SW-W.
Scanstates, Am. S. S.	Copenhagen	New York	53 30 N.	32 00 W.	19	6a, 20	21	29.03	SW.	WSW, 9	WNW.	SW, 10.	SW-WSW.
Mormacsun, Am. S. S.	do	Boston	57 03 N.	23 30 W.	23	2a, 23	23	29.25		WNW, 9	WNW.	NW, 10.	
Do	do	do	55 45 N.	29 00 W.	24	6a, 24	26	29.40	W.	WSW, 7	W.	W, 11	S-W.
Manhattan, Am. S. S.	Cobh	New York	49 06 N.	31 18 W.	27	10a, 27	27	29.78	WNW.	W, 10	WSW.	NW, 11.	W-WNW.
Black Condor, Am. S. S.	Antwerp	do	50 10 N.	9 10 W.	28	10a, 28	28	29.27	W.	W, 7	WSW.	NW, 10.	W-NW.
Manhattan, Am. S. S.	Cobh	do	47 18 N.	38 00 W.	28	10a, 28	[4]1	29.14	SSW.	WSW, 10	NW.	WNW, 10.	SSW-N.
NORTH PACIFIC OCEAN													
Ixion, Br. S. S.	Yokohama	Vancouver, B. C.	50 01N.	155 30 W.	[1] 31	[1]3p, 31	2	29.12	W.	SSW, 6	NW.	W, 10.	SSE-SSW.
Heian Maru, Jap. M. S.	do	do	50 42 N.	160 18 W.	1	[1]1p, 31	2	29.16	WNW.	NE, 4	NW.	WNW, 8.	
Maunalei, Am. S. S.	Honolulu	San Francisco	24 18 N.	153 20 W.	2	2p, 2	2	29.90	SE.	E, 8	ESE.	E, 8	ESE-E-ESE.
La Placentia, Am. S. S.	Vancouver, B. C.	Port San Luis	47 10 N.	125 15 W.	2	6p, 2	2	29.49	SE.	SE, 8		SE, 9	None.
Ludington, U. S. A. T.	Honolulu	Midway Is.	27 21 N.	176 41 W.	2	6a, 2	4	29.82	S.	NNE, 8	E.	NNE, 11.	SSW-NNE.
Mapele, Am. S. S.	Portland, Ore.	Honolulu	43 24 N.	129 54 W.	1	2p, 2	4	29.66	SSE.	W, 8	NNW.	NNW, 8.	
Charcas, Am. S. S.	Acajutla	Salina Cruz	15 37 N.	93 41 W.	3	4p, 3	5	29.81	NW.	WNW, 3	NNE.	N, 10	WNW-NW.
Manoeran, Du. M. S.	Legaspi, P. I.	Los Angeles	35 12 N.	159 54 E.	4	2p, 4	5	29.30	WSW.	WSW, 7	W.	W, 9	SSW-WNW.
Dalblair, Br. S. S.	San Francisco	Milke	31 — N.	140 — E.	5	11p, 5	8	29.64	S.	NNW, 10	NW.	NNW, 10.	SSE - NNW SW.
Kunikawa Maru, Jap. M. S.	Yokohama	San Francisco	45 45 N.	173 28 E.	6	Noon, 9		28.53	ESE.	S, 5		SE, 9	ESE-SW.
Maliko, Am. S. S.	San Francisco	Honolulu	37 26 N.	123 47 W.	7	8p, 7	8	29.81	W.	W, 8	NW.	NW, 10.	W-WNW.
Maunalei, Am. S. S.	Honolulu	San Francisco	37 06 N.	125 12 W.	8	3p, 8	8	30.00	NW.	NW, 8	NW.	NW, 8.	
Manoeran, Du. M. S.	Legaspi, P. I.	Los Angeles	42 12 N.	160 00 W.	8	11p, 9	10	29.38	SSW.	S, 9	SW.	S, 10	S-SW.
Nasiro Maru, Jap. M. S.	Shanghai	San Pedro	43 12 N.	175 24 W.	9	Mdt., 9	10	29.24		WSW, 8		WSW, 8	

[1] January. [2] Position approximate. [3] Barometer uncorrected. [4] March.

OCEAN GALES AND STORMS, FEBRUARY 1939—Continued

Vessel	Voyage		Position at time of lowest barometer		Gale began February	Time of lowest barometer, February	Gale ended February	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH PACIFIC OCEAN—Continued			° ′	° ′				*Inches*					
Pres. Taft, Am. S. S.	Honolulu	Yokohama	34 37 N.	150 42 E.	10	Noon, 10.	11	29.62	NW.	NNW, 5.	NW.	NW, 9.	N-NW.
Peter Maersk, Dan. M. S.	Yokohama	Los Angeles	40 06 N.	151 54 E.	11	10p, 10.	11	29.46	NNW.	W, 7.	NW.	NNW, 8.	W-NNW.
Bralanta, Nor. M. S.	Los Angeles	Yokohama	34 42 N.	174 56 W.	10	11a, 11.	11	29.37	S.	SW, 6.	W.	W, 10.	SW-WSW.
Marchen Maersk, Dan.	do	do	34 00 N.	176 06 E.	11	1a, 12.	13	29.32	S.	SW, 9.	W.	WSW, 10.	SW-WSW.
Lightship #92, U. S.	On station		48 30 N.	125 00 W.	13	4p, 14.	13	[1]29.74		NE, 2.		SSE, 8.	
Bralanta, Nor. M.S.	Los Angeles	Yokohama	34 43 N.	178 35 E.	12	6p, 14.	15	29.41	W.	SW, 10.	WNW.	W, 10.	SW-W.
Zuiyo Maru, Jap. S. S.	Osaka	Los Angeles	[1]39 54 N.	174 03 W.	14	4a, 14.	15	28.97		WSW, 8.		WSW, 9.	
Huzisan Maru, Jap. M. S.	Yokohama	do	39 00 N.	159 00 E.	14	6a, 14.	14	29.50	WNW.	WNW, 8.	NW.	NW, 8.	WNW-NW.
Peter Maersk, Dan. M. S.	do	do	46 30 N.	174 00 W.	14	4p, 14.	14	28.83	NNE.	NNE, 8.	N.	NNE, 8.	NE-N.
Sawokla, Am., M. S.	Hong Kong	do	33 42 N.	155 07 E.	16	6a, 16.	16	29.25	SSE.	W, 8.	NNW.	SSW, 9.	SSW-NW.
Marchen Maersk, Dan. M. S.	Los Angeles	Yokohama	32 00 N.	157 21 E.	16	10a, 16.	16	29.38	S.	SW, 10.	N.	WSW, 10.	S-WNW.
Bralanta, Nor. M. S.	do	do	34 36 N.	170 14 E.	16	11p, 16.	17	29.21	S.	SW, 9.	W.	W, 12.	S-W.
Mindanao, Phil. S. S.	Manila	San Francisco	36 30 N.	176 54 E.	16	Noon, 17.	17	29.23	S.	WSW, 9.	W.	WSW, 9.	S-W.
Huzisan Maru, Jap. M. S.	Yokohama	Los Angeles	40 06 N.	178 02 E.	16	Noon, 17.	17	28.67	S.	SSW, 9.	SW.	SW, 11.	S-SW.
Getuyo Maru, Jap. M. S.	Kobe	do	45 42 N.	173 00 E.	17	3p, 17.	18	28.56	NE.	N, 10.	WSW.	N, 10.	NNE-NW.
Beckenham, Br. S. S.	Muroran	Vancouver, B. C.	46 11 N.	176 00 E.	17	2a, 18.	18	28.26	NNE.	NW, 8.	W.	NW, 8.	NNE-NW.
Sawokla, Am. M. S.	Hong Kong	Los Angeles	33 20 N.	174 07 E.	19	6a, 20.	20	29.61	SSW.	SW, 8.	WNW.	SW, 8.	SSW-W.
W. B. Walker, Br. M. S.	Yokohama	San Francisco	36 10 N.	146 55 E.	21	2a, 22.	22	29.19	ESE.	WSW, 8.	NW.	NNW, 10.	S-NNW.
Gefion, Nor. M. S.	Los Angeles	Kobe	32 58 N.	160 23 E.	22	10p, 22.	23	29.76	SW.	W, 9.	NW.	W, 10.	SSW-W.
Floridian, Am. S. S.	Balboa	Los Angeles	15 36 N.	96 36 W.	23	5p, 23.	23	29.88	NNW.	W, 3.	NE.	N, 8.	NE-W-NNW.
Skjelbred, Nor. M. S.	Yokohama	San Francisco	42 24 N.	167 36 E.	23	11a, 23.	24	29.42		ENE, 8.		ENE, 8.	
Pres. Coolidge, Am. S. S.	Honolulu	do	26 30 N.	149 24 W.	27	2a, 27.	27	30.10		E, 4.		E, 8.	

[1] Position approximate.

[2] Barometer uncorrected.

NORTH PACIFIC OCEAN, FEBRUARY 1939

By WILLIS E. HURD

Atmospheric pressure.—During most of February 1939 low pressure overlay the Bering Sea and the northwestern part of the North Pacific Ocean, with the average center in the Bering Sea. At St. Paul Island pressure for the month was 29.42 inches, which is 0.23 inch below the normal. The lowest barometer reading at St. Paul—also the lowest for the month in Pacific waters—was 28.00 inches on the 13th.

In the eastern North Pacific, particularly between the American coast and longitude 160° W., LOWS were unusually deficient for the month. Throughout middle latitudes in this area, pressure was almost unbrokenly high and at the crest, near 35°–45° N., 135° to 145° W., the barometer averaged close to 30.50 inches. Along the American coast, from Kodiak, Alaska, to Mazatlan, Mexico, pressure was abnormally high.

In the Far East the oceanic extension of the Asiatic anticyclone was unusually well developed, with the average pressure at Naha, Nansei Islands, 30.13 inches, which is 0.08 inch above the normal.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, February 1939, at selected stations*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	30.18	+0.06	30.82	6	29.64	13
Dutch Harbor	29.45	−.15	30.28	5	28.50	12
St. Paul	29.42	−.23	30.20	5	28.00	13
Kodiak	29.70	+.08	30.34	6	28.90	11
Juneau	29.99	+.07	30.44	19	29.00	11
Tatoosh Island	30.08	+.08	30.75	16	29.47	5
San Francisco	30.16	+.06	30.48	14	29.67	3
Mazatlan	29.95	+.02	30.02	5, 13, 14, 19	29.86	26
Honolulu	30.02	−.03	30.17	16	29.78	2
Midway Island	30.01	+.02	30.21	28	29.83	14
Guam	29.88	−.03	30.00	19	29.77	2
Manila	29.91	+.02	30.03	15	29.83	2–5, 11, 26
Hong Kong	30.07	+.01	30.27	15	29.96	1
Naha	30.13	+.08	30.33	8	29.86	28
Titijima	30.06	+.08	30.27	16	29.68	6
Petropavlosk	29.56	−.12	30.24	26	29.03	9

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Storms and gales of the extratropics.—Storminess on the North Pacific during February was confined almost altogether, so far as reports indicate, to the northwestern quarter of the ocean, with southern boundary along the 30th parallel from longitude 140° E. to the 180th meridian, and thence northeastward to about the 50th parallel at longitude 150° W. Outside of this extensive area, the few gales reported occurred near the coastal waters of the United States, on the 1st to 3d and on the 8th, and the 13th, with the exception of two occurrences of tradewinds intensified to force 8 on the 2d and 27th northeast of the Hawaiian Islands, and an isolated gale of force 11 encountered by the U. S. A. T. *Ludington* near Midway Island on the 2d.

The month as a whole was far less stormy than the preceding January, both with respect to the intensity of the winds and to the areal extent of their occurrence. Only one gale in February was reported to have attained the strength of force 12. That was encountered on the 17th by the Norwegian motorship *Bralanta* near 34° N., 168° E. There were two gales of force 11, one already mentioned as experienced by the *Ludington* on the 2d; the other occurred on the 17th near 40° N., 178° E., where it was reported by the Japanese motorship *Huzisan Maru*. Winds attaining force 10 occurred on some seven or eight other dates, of which five, the 5th, 12th, 14th, 16th, and 23d, had the high winds between parallels 30° and 35° N., to the westward of the 180th meridian.

The lowest barometer reading reported by a ship in the month was 28.26 inches, read on the British steamship *Beckenham* during a northwest gale of force 8 on the 18th close to 46° N., 176° E.

At the beginning of the month stormy weather was mostly confined to two small areas, one in the neighborhood of 50° N., 150° to 160° W., on the 1st and 2d; the other to the near coastal region of Washington and Oregon on the 1st to 3d. In addition, isolated gales occurred near Midway Island and the eastern Hawaiian Islands on the 2d.

In east longitudes there were scattered gales beginning on the 4th and 5th, the strongest of which, a wind of force 10, occurred on the 5th in a small cyclone then centered off southeastern Japan. Gales continued to be localized

for the most part until the 10th over the great barometrically depressed area which covered the western part of the northern and central steamer routes. By the 11th the weather had become more generally stormy within the region north of the 30th parallel and west of longitude 170° W., with gales of force 8 to 10 reported from many parts of the area. From the 11th until the 17th the weather in general was the roughest of the month within the area mentioned. Following the 17th, gales were few and scattered, and only on the 22d and 23d, near 36° N., 147° E., and 33° N., 160° E., respectively, were they experienced of force higher than 8.

Tropical disturbances and gales.—Elsewhere in this issue of the REVIEW is a report by the Rev. Bernard F. Doucette, Weather Bureau, Manila, P. I., of a depression that occurred in the Far East during February 3–16, 1939.

In southern Mexican coastal waters, Tehuantepecers occurred as follows: Of force 9 on the 3d, force 10 on the 4th, force 7 on the 13th, and of force 8 on the 23d.

Fog.—The region of most frequent fog this month lay, roughly, between latitudes 35° and 47° N., longitudes 130° and 150° W., thus rather closely conforming to the crest of the eastern North Pacific anticyclone during the days of fog occurrence. Here fog was observed on 12 days between the 11th and 24th, inclusive. Off the Washington and Oregon coasts fog was reported on the 14th and 24th, and off the California coast, on the 14th and 15th. A number of observations of fog were made in upper mid-ocean on the 28th.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, FEBRUARY 1939

BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Depression, February 3–16, 1939.—A low center appeared about 250 miles south of Yap during the morning hours of February 3 and soon manifested the strength of a depression. This center moved in a westerly direction until it reached the regions about 200 miles east of southern Mindanao, where it remained stationary from February 7 to 9 inclusive. Late in the afternoon of February 9, it began to move along a northwesterly course toward Samar Island. It reached this island February 12, where it inclined to the north, and then to the northeast after passing San Bernardino Strait. It then moved northeast from the ocean regions east of southern Luzon, changing to the north-northeast, which caused it to pass about 120 miles north of the Bonins, February 15. It crossed the 150th meridian on February 16 on its course toward the Aleutian Islands and adjacent regions.

Throughout its course over the ocean regions east of Mindanao as well as over Samar Island, it seemed to be of minor importance. The barometers at the stations in Samar recorded values close to 752 mm (29.606 inches) on February 12 as the center inclined northward. Heavy rainfall occurred over Samar Island as well as neighboring islands during the progress of this storm. The Manila newspapers had reports from Surigao Province of extensive floods over northeastern Mindanao. From Butuan, Agusan Province, came reports that almost all the seeded land was inundated from February 8 to 13, when the rains decreased.

There are some interesting aspects concerning the upper winds during these days. During the last ten days of January there was a steady westerly current over the stations of the Dutch East Indies, velocities at many places reaching values as high as 50 k. p. h. and even more. At the same time, over Guam and the Philippines, there was an easterly current. It seemed that circulation could not form because the region of convergence of these two air streams was over or close to the Equator. February 1 and the following days the easterly current over Guam and the Philippines was quite constant in strength, there being no sudden increase in velocities, which were as high as 50 k. p. h. Very likely the center formed because of some variation in strength of the westerly current south of the Equator, but observations for vertification are not available at the time of writing this article. Then, February 7 to 9, the winds over Guam shifted more toward the southeast quadrant and weakened, while the velocities over the Philippine stations increased to values between 40 and 75 k. p. h. Cebu was the first station to show this increase, which appeared on the 7. This occurred as the center moved from its position about 200 miles east of Mindanao toward Samar Island. The shifting to the southwest quadrant first appeared at Zamboanga February 11, then at Cebu on the 12th. Zamboanga reported velocities higher than Cebu, but it must be remembered that conditions at Zamboanga were more favorable for longer ascents than at Cebu. On February 13, the center was recurving to the northeast and on February 14, the whole archipelago was under the influence of the easterly current again. South of the Philippines, the Dutch East Indies had the same conditions as during the last few days of January. No reports were received from February 4 to 9, but after the latter day, there was evidence of a west quadrant air stream with velocities between 15 and 75 k. p. h. reported. After February 13, the velocities (not all stations reported) weakened as far as could be known.

In conclusion, the writer considers the main interest in this situation to consist in the fact that a definite center formed between these two air streams at the time of the year when the air of the Northern Hemisphere is stable, thus eliminating to a great extent the effect of violent convection. Because of this aspect, it might be possible to learn more about the causes of the variations in the velocities of the air streams by a more detailed and extensive study of the situation which prevailed during these days.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—*Condensed climatological summary of temperature and precipitation by sections, February 1939*

[For description of tables and charts, see REVIEW, January, p. 31]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	61.5	+4.7	Andalusia	87	10	St. Bernard	10	22	10.21	+5.00	Falkville	17.55	Millry	5.82
Arizona	47.0	−8.9	Gould's Ranch	81	23	Alpine	−23	3	1.24	−.09	Pinal Ranch	2.88	Mohawk	.10
Arkansas	48.6	.0	4 stations	76	[1] 10	Mammoth Springs	4	4	8.55	+5.12	Pine Bluff	16.69	Rogers	4.21
California	52.7	−5.5	Ukiah	83	17	2 stations	−25	9	2.25	−2.22	Crescent City (near)	11.09	Iron Mountain	.05
Colorado	31.2	−7.9	Sedgwick	70	18	Dillon	−41	2	1.09	+.10	La Veta Pass	3.58	Garnett	.09
Florida	67.2	+5.6	Avon Park	94	27	Glen St. Mary	20	24	2.24	−.88	Mason	8.78	Everglades	.00
Georgia	58.5	+5.5	5 stations	83	[1] 7	Blairsville	8	23	9.11	+4.19	Clayton	13.58	Brunswick	1.85
Idaho	29.7	−5.3	Lewiston	60	11	Deception Creek	−31	9	2.01	+.28	Deception Creek	8.95	Challis	.09
Illinois	31.8	+.7	Cairo	71	9	Mt. Carroll	−3	10	3.35	+1.42	Brookport	9.10	Dixon	1.21
Indiana	32.1	+1.7	Madison	77	19	Marengo	−14	4	4.15	+1.71	Rome	8.90	Albion	1.50
Iowa	20.9	−2.0	2 stations	60	13	2 stations	−23	11	1.75	+.65	Ames	3.04	Sioux Center	.53
Kansas	30.7	−2.6	Independence	70	13	Oberlin	−18	10	1.22	+.22	Marion	2.74	Oberlin	.42
Kentucky	40.1	+3.2	2 stations	79	19	Paducah (near)	−5	4	7.99	+4.55	Williamsburg	11.87	Russellville	4.03
Louisiana	56.4	+2.5	do	84	[1] 10	Pollock	20	22	5.69	+1.15	St. Joseph	10.97	Ville Platte	2.42
Maryland-Delaware	39.6	+6.0	do	75	[1] 20	2 stations	0	23	5.22	+2.27	La Plata, Md	6.73	Mt. Savage Summit, Md.	2.41
Michigan	20.5	+.4	Monroe	59	20	Watersmeet	−36	16	2.68	+1.04	Calumet	10.15	Hart	.66
Minnesota	5.2	−7.1	2 stations	47	18	Meadowlands	−51	21	1.41	+.65	Pigeon River Bridge	3.86	Artichoke Lake	.23
Mississippi	52.2	+2.7	Fruitland Park	85	18	2 stations	19	[1] 22	8.15	+3.25	Louisville	13.18	Biloxi	3.96
Missouri	33.0	−.1	Campbell	71	10	Conception	−9	10	3.17	+1.08	New Madrid	10.09	LaBelle	.71
Montana	15.8	−6.2	2 stations	56	18	Glasgow	−48	10	.81	+.05	Trout Creek (near)	5.08	Lustre (near)	.01
Nebraska	21.5	−4.6	Benkelman	68	12	Merriman	−28	10	.87	+.17	Tekamah	2.75	Greeley	.00
Nevada	28.0	−5.8	3 stations	68	[1] 15	2 stations	−20	2	.79	−.28	Marlette Lake	3.76	Mina	.10
New England	25.3	+2.7	Danbury, Conn	70	20	First Conn. Lake, N. H.	−22	17	3.38	+.27	Norwalk, Conn	6.04	Bethlehem, N. H.	1.34
New Jersey	36.3	+5.8	2 stations	74	20	Layton (near)	1	17	5.55	+1.94	Tuckerton	6.90	Layton (near)	3.94
New Mexico	29.0	−8.2	Columbus	79	27	Gavilan	−40	3	.61	−.11	Truchas	2.63	2 stations	.00
New York	26.6	+4.1	2 stations	69	20	Stillwater Reservoir	−25	23	3.77	+1.07	Bridgehampton	6.76	Brockport	1.63
North Carolina	48.5	+5.7	do	81	[1] 3	Mount Mitchell	−10	24	7.73	+3.65	Rock House	16.27	Manteo	3.76
North Dakota	−.8	−10.2	Carson	51	18	Willow City	−46	15	.63	+.16	Grafton	1.64	Bowman	.05
Ohio	32.8	+3.4	Portsmouth	78	19	2 stations	−9	16	4.28	+1.66	Dam No. 28	8.18	Willoughby	2.11
Oklahoma	38.9	−2.1	Antlers	86	9	Hooker	−4	10	1.67	+.29	Flashman Tower	7.46	2 stations	.09
Oregon	32.2	−2.9	McKinley	72	17	Ukiah	−29	9	3.53	+.37	McNamurs	17.20	Paisley	.20
Pennsylvania	33.7	+5.3	Phoenixville	74	20	Brookville	−10	25	4.45	+1.57	Zionsville	8.60	Covington	2.33
South Carolina	53.2	+5.8	4 stations	82	[1] 10	Caesars Head	6	23	8.87	+4.63	Caesars Head	15.58	Kingstree	6.31
South Dakota	11.1	−7.9	Vale	62	18	Bison	−42	10	.69	+.13	Lemmon	2.07	Rochford	.11
Tennessee	44.7	+3.4	2 stations	81	19	Elkmont	4	23	9.85	+5.45	Sewanee	15.59	Elizabethton	4.29
Texas	48.5	−2.8	Mercedes	98	27	Muleshoe	−6	[1] 3	1.86	+.08	Naples	9.84	8 stations	.00
Utah	20.2	−9.6	St. George	62	23	Woodruff	−27	2	1.29	+.01	Timpanogos Summit.	5.62	Wendover	.01
Virginia	43.2	+5.9	2 stations	79	[1] 19	Big Meadows	−1	23	5.25	+2.11	Floyd	9.12	Hopewell	2.98
Washington	32.1	−2.2	Mottinger	61	18	Deer Park (near)	−27	9	4.44	+.45	Naselle	19.01	2 stations	.58
West Virginia	39.0	+5.6	Hinton	80	19	2 stations	−2	[1] 23	5.72	+2.56	Pickens	8.26	McNeill	2.40
Wisconsin	14.3	−2.6	Milwaukee	53	19	do	−43	21	1.74	+.52	Amery	3.57	Weyerhauser	.93
Wyoming	14.0	−8.0	3 stations	59	18	Eden	−42	2	.85	+.07	Bechler River	5.84	Clark	.02
Alaska (January)	1.7	−.3	Treepoint	51	[1] 3	Tanana	−57	20	2.72	+.57	Little Port Walter	28.14	Barrow	.00
Hawaii	70.1	+1.6	Kaanapali (Maui)	89	6	Kanalohuluhulu	40	15	8.56	+1.44	Pihonua	54.00	Pulehu	.00
Puerto Rico	71.7	−1.0	Coloso	92	4	3 stations	50	[1] 2	2.22	−.89	La Mina (El Yunque).	7.42	Coamo (near)	.07

[1] Other dates also.

TABLE 2.—*Climatological data for Weather Bureau stations, February 1939*

[Compiled by Annie E. Small, by official authority U. S. Weather Bureau]

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*							*0–10*	*In.*	*In.*
New England							28.7	+3.3										76	4.13	+0.9										6.5		
Eastport	75	67	85	29.97	30.06	+0.08	23.6	+2.1	51	15	33	0	17	14	45	21	16	74	3.17	−0.2	17	12.7	nw.	38	sw.	15	4	8	16	7.2	12.8	2.3
Greenville, Maine	1,069	4	41	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Maine	103	82	117	29.95	30.08	+.06	24.8	+1.0	50	15	34	0	17	16	31	22	17	74	3.52	−.5	15	7.6	n.	24	se.	28	9	6	13	5.9	9.8	1.0
Concord	289	54	72	29.76	30.09	+.05	25.4	+2.6	50	20	35	−4	17	16	39	.....	.....	.....	2.70	−.2	13	6.0	n.	22	nw.	9	7	7	14	6.6	8.3	2.3
Burlington	403	11	48	29.59	30.06	+.03	20.0	+.6	51	20	31	−11	17	9	41	17	13	78	3.08	+1.5	11	11.4	s.	38	s.	17	5	6	17	7.2	17.0	4.5
Northfield	876	12	60	29.07	30.06	+.02	19.3	+2.9	56	20	32	−15	17	7	45	18	15	84	3.04	+.8	12	8.0	sw.	31	s.	28	5	6	17	7.5	15.2	10.5
Boston [1]	29	33	62	.....	30.07	+.03	32.2	+3.4	66	20	41	9	17	24	33	.....	.....	74	3.79	+.4	13	11.9	w.	47	sw.	15	7	4	17	.....	4.7	T
Nantucket	12	14	90	30.06	30.08	+.04	36.2	+5.5	54	15	43	14	17	29	29	33	29	80	5.38	+2.0	13	15.9	sw.	46	sw.	15	8	6	14	6.2	1.5	.0
Block Island	26	11	46	30.05	30.08	+.02	35.2	+4.8	56	15	43	12	17	28	26	33	29	78	5.45	+1.8	11	18.1	nw.	45	nw.	16	9	8	11	5.8	1.5	.0
Providence	159	215	251	29.90	30.08	+.03	33.2	+4.2	64	15	42	8	17	24	32	30	25	74	4.09	+.4	12	11.8	nw.	52	nw.	16	9	5	14	6.1	5.0	.0
Hartford	159	66	100	29.93	30.11	+.05	31.5	+4.3	66	20	40	6	17	23	33	.....	.....	.....	4.72	+.9	14	7.2	nw.	38	sw.	15	6	8	14	6.9	8.6	T
New Haven	106	74	153	29.98	30.10	+.03	34.0	+5.0	63	20	42	8	17	26	29	30	24	69	6.46	+2.5	13	9.4	n.	40	s.	15	8	8	12	6.0	5.7	.0
Middle Atlantic States							39.0	+5.8										71	4.98	+1.8									6.4		
Albany [1]	292	26	40	29.73	30.07	.00	24.6	+.5	58	20	35	−3	17	14	41	22	17	73	3.07	+.6	14	10.8	s.	34	nw.	16	2	8	18	7.4	11.9	.2
Binghamton	871	57	79	29.12	30.08	.00	29.1	+5.1	61	20	39	0	16	19	34	26	21	75	3.89	+1.6	12	7.6	nw.	24	se.	28	0	11	17	7.9	11.0	.0
New York	314	415	454	29.75	30.10	+.02	37.4	+6.1	67	20	46	14	17	29	33	32	25	64	5.97	+2.2	11	16.1	nw.	69	sw.	15	7	7	14	6.2	3.9	.0
Harrisburg [1]	374	94	104	29.75	30.14	+.05	36.3	+6.1	69	20	45	13	23	27	36	31	26	72	4.00	+1.0	12	9.5	nw.	42	sw.	20	8	7	13	6.2	1.1	.0
Philadelphia	114	174	367	30.00	30.13	+.03	39.4	+5.5	70	20	48	14	17	31	33	34	29	70	6.12	+2.8	13	13.7	sw.	50	sw.	15	7	9	12	6.4	.5	.0
Reading	323	283	306	29.76	30.13	.....	37.6	+8.8	69	20	46	12	17	29	34	32	24	63	4.55	+1.1	10	13.1	nw.	53	se.	28	7	9	12	6.1	.9	.0
Scranton	805	72	104	29.18	30.09	+.01	32.4	+5.1	63	20	42	4	17	23	36	28	21	66	3.72	+.7	14	7.2	sw.	32	se.	15	6	10	12	6.2	5.9	.0
Atlantic City	52	37	172	30.07	30.13	+.02	39.6	+6.0	61	18	46	17	23	33	22	36	31	75	6.01	+2.6	14	17.0	s.	51	s.	15	9	5	14	6.3	T	.0
Sandy Hook	22	10	57	30.08	30.10	.....	36.5	+4.4	61	15	43	16	16	30	22	33	29	77	5.45	+1.7	12	15.3	nw.	61	s.	15	8	4	16	6.3	1.6	.0
Trenton	190	89	107	29.90	30.12	.....	37.8	+7.1	69	20	46	13	17	29	36	33	27	69	5.56	+2.3	12	9.7	s.	45	s.	15	9	5	14	6.7	1.0	.0
Baltimore	123	100	215	29.99	30.12	+.01	41.8	+6.4	74	20	50	18	23	34	31	36	29	63	6.52	+3.1	12	11.0	s.	35	nw.	7	11	2	15	5.8	.2	.0
Washington	112	62	85	29.99	30.12	+.01	42.3	+7.0	74	19	51	17	23	34	37	36	30	64	5.71	+2.4	11	7.5	s.	28	nw.	22	10	2	16	6.0	.3	.0
Cape Henry	18	8	54	30.12	30.14	.....	48.0	+6.8	76	20	57	25	23	39	35	44	42	84	5.96	+2.7	11	12.4	sw.	44	nw.	15	7	8	13	6.3	.0	.0
Lynchburg	686	144	184	29.38	30.14	+.03	44.7	+4.4	76	19	55	17	23	34	36	38	31	63	4.99	+1.8	12	8.4	sw.	45	sw.	15	9	4	15	6.4	T	.0
Norfolk	91	80	125	30.05	30.15	+.04	49.8	+7.1	76	3	60	23	23	40	36	44	39	76	5.52	+2.3	10	10.8	sw.	36	n.	15	8	3	17	6.4	.0	.0
Richmond	144	11	52	29.98	30.14	+.03	45.5	+5.9	76	19	56	19	23	36	37	40	35	72	3.87	+.7	11	9.2	sw.	33	sw.	15	11	3	14	5.8	.0	.0
Wytheville	2,304	49	55	.....	30.11	−.01	40.8	+5.7	71	19	52	10	23	30	34	.....	.....	73	3.68	+.7	14	8.1	w.	37	w.	15	9	8	11	.....	1.2	.0
South Atlantic States							54.0	+6.2										77	7.30	+3.6									6.2		
Asheville	2,253	89	104	27.74	30.15	+.02	44.4	+5.9	75	20	56	10	23	33	36	39	35	74	5.72	+2.6	15	10.5	se.	36	sw.	15	7	4	17	6.6	.2	.0
Charlotte	779	63	86	29.28	30.13	+.01	49.6	+5.7	76	19	59	19	23	40	29	44	38	69	8.08	+3.9	14	8.6	sw.	34	sw.	15	7	5	16	6.7	.0	.0
Greensboro [1]	856	6	56	29.18	30.14	.....	45.2	.....	74	19	56	15	23	34	35	40	36	78	6.40	.....	14	8.9	sw.	33	sw.	3	7	6	15	6.6	.0	.0
Hatteras	11	5	50	30.15	30.16	+.05	53.4	+6.0	70	20	61	30	23	46	30	50	47	85	5.86	+1.8	11	13.6	sw.	39	nw.	15	10	7	11	5.7	.0	.0
Raleigh	376	103	140	29.72	30.14	+.03	51.0	+7.8	76	19	62	20	23	41	33	46	42	79	9.73	+5.8	13	9.9	sw.	36	w.	3	8	9	11	5.6	.0	.0
Wilmington	72	73	107	30.08	30.16	+.04	55.2	+7.3	78	11	64	24	23	46	36	50	47	79	5.97	+2.7	13	11.5	s.	41	s.	15	10	7	11	5.4	.0	.0
Charleston	48	11	92	30.11	30.16	+.04	57.8	+5.4	76	11	66	28	23	50	26	53	50	83	8.96	+6.0	12	11.3	s.	30	s.	26	9	2	17	6.1	.0	.0
Columbia, S. C.	347	70	91	29.76	30.15	+.04	54.6	+6.4	77	10	65	22	23	45	32	48	42	69	9.39	+5.6	14	9.5	s.	33	sw.	3	10	7	11	5.7	.0	.0
Greenville, S. C.	1,040	70	78	29.00	30.12	.....	48.6	+5.3	74	19	58	17	23	39	29	43	39	74	8.69	+3.5	14	7.9	sw.	37	sw.	15	6	7	15	6.7	.0	.0
Augusta	182	62	77	29.93	30.12	.00	55.2	+5.3	78	10	65	24	23	45	32	49	45	76	9.61	+5.3	13	6.7	s.	33	w.	3	7	7	14	6.1	.0	.0
Savannah	65	73	152	30.07	30.14	+.02	60.3	+6.3	80	3	70	29	23	50	29	54	51	82	5.81	+2.7	13	11.5	sw.	34	sw.	26	8	5	15	6.2	.0	.0
Jacksonville	43	86	110	30.10	30.14	+.02	64.3	+6.3	84	11	74	29	23	55	32	57	54	79	2.49	−.5	10	9.0	s.	33	sw.	15	5	9	14	6.5	.0	.0
Florida Peninsula							72.3	+5.8										81	1.24	−0.7									4.3		
Key West	21	10	64	30.07	30.09	+.02	75.4	+4.9	85	6	80	57	23	70	14	69	67	82	2.45	+1.1	5	11.0	se.	23	n.	22	13	9	6	4.2	.0	.0
Miami	25	124	168	30.10	30.13	+.03	73.2	+6.1	82	7	78	43	23	68	24	67	65	79	.38	−1.4	5	11.3	se.	25	s.	15	11	13	4	4.9	.0	.0
Tampa	35	88	197	30.09	30.13	+.03	68.4	+6.5	85	27	78	35	23	59	33	62	59	81	.90	−1.7	5	12.3	s.	32	s.	15	17	7	4	3.7	.0	.0
East Gulf States							55.0	+3.1										77	7.62	+2.8									6.5		
Atlanta [1]	976	5	72	29.07	30.11	−.01	49.7	+4.4	77	19	60	19	23	39	33	45	41	78	9.34	+4.6	15	11.3	e.	38	s.	15	10	2	16	6.2	.0	.0
Macon	370	79	87	.....	30.13	+.01	54.1	+4.8	77	19	64	24	23	44	31	.....	.....	76	11.44	+7.0	13	7.9	s.	25	s.	21	6	6	16	.....	.0	.0
Thomasville	273	49	58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Apalachicola	35	11	.....	30.08	30.11	.....	59.4	+3.1	75	28	66	31	23	53	20	57	55	88	3.84	−.1	15	9.6	s.	27	se.	17	9	2	17	6.6	.0	.0
Pensacola	56	149	185	30.04	30.10	−.01	57.0	+1.8	70	9	64	29	22	50	29	54	51	83	5.89	+1.6	14	14.8	s.	38	sw.	15	5	7	16	6.7	.0	.0
Anniston	741	9	.....	.....	.....	.....	51.6	+5.8	77	19	62	19	23	41	29	.....	.....	.....	8.29	+2.9	14	.....	nw.	.....	.....	.....	8	8	12	.....	.0	.0
Birmingham	700	11	48	29.34	30.09	−.03	51.9	+3.9	76	19	62	22	22	42	32	45	40	70	8.24	+3.2	13	9.7	s.	34	se.	27	7	11	10	5.8	.0	.0
Mobile	57	86	161	30.03	30.09	−.02	56.7	+2.0	78	10	66	29	23	48	33	52	48	79	7.44	+2.1	15	11.7	s.	35	sw.	15	5	7	16	7.0	.0	.0
Montgomery	218	92	105	29.86	30.12	.00	55.4	+3.8	82	10	66	27	22	45	33	49	44	73	7.51	+2.1	16	8.8	e.	28	sw.	3	8	5	15	6.4	.0	.0
Meridian	378	67	92	29.68	30.09	−.02	53.0	+3.4	81	9	64	24	23	42	35	47	42	74	9.95	+4.5	13	7.8	s.	26	sw.	3	8	6	14	6.1	.0	.0
Vicksburg	247	82	102	29.80	30.06	−.04	53.0	+1.2	80	9	62	29	22	44	32	47	41	70	8.33	+3.5	12	10.7	se.	30	s.	19	6	7	15	6.8	T	.0
New Orleans	53	76	84	30.02	30.08	−.01	60.0	+2.7	82	10	69	35	22	52	31	55	51	77	4.20	.0	12	9.0	se.	25	sw.	26	5	7	16	7.0	.0	.0
West Gulf States							50.9	−0.6										70	3.52	+1.0									5.9		
Shreveport	249	92	227	29.78	30.06	−.03	51.2	+.3	78	18	61	25	21	42	39	47	42	70	8.96	+5.7	14	13.3	s.	42	nw.	14	8	8	12	6.1	T	.0
Bentonville	1,303	12	38	28.71	30.12	+.02	37.0	−1.5	67	13	48	6	21	26	33	.....	.....	.....	4.47	+2.3	11	8.6	n.	22	s.	7	9	6	13	.....	.4	.0
Fort Smith	463	57	82	29.59	30.08	−.02	41.4	−1.4	74	9	51	13	21	32	34	36	30	70	5.88	+3.3	12	8.5	e.	30	w.	28	10	4	14	5.9	6.2	.0
Little Rock	357	94	102	29.68	30.07	−.04	44.0	−.9	72	9	53	22	22	35	27	40	35	73	8.59	+4.8	12	9.1	se.	30	w.	28	9	5	14	6.4	1.0	.0
Austin	605	68	90	29.38	30.02	.....	51.6	−1.8	83	9	64	26	21	39	44	45	39	68	1.47	−.9	6	8.5	n.	28	nw.	9	11	7	10	5.4	.0	.0
Brownsville	57	88	96	29.89	29.96	.....	63.6	+1.0	85	14	73	39	22	54	32	57	52	72	.28	−.9	4	13.5	se.	39	s.	9	4	11	13	6.5	.0	.0
Corpus Christi	20	11	78	29.97	29.99	−.06	59.8	+1.4	87	27	68	33	22	51	32	54	50	75	.14	−1.3	6	12.4	n.	33	n.	20	6	12	10	6.1	.0	.0
Dallas	512	220	227	29.48	30.04	.....	45.6	.....	78	9	55	18	21	36	36	40	33	66	4.35	+2.1	14	13.5	se.	54	sw.	27	13	2	13	5.3	.3	.0
Fort Worth	679	92	110	29.32	30.04	−.03	45.4	−2.9	80	9	56	18	21	35	37	.....	.....	.....	2.42	+.7	12	11.8	n.	49	w.	27	12	5	11	4.9	T	.0
Galveston	54	106	114	29.97	30.03	−.04	57.2	+.9	71	20	63	33	22	51	23	53	50	79	1.38	−1.4	11	12.8	se.	27	s.	19	4	12	12	6.0	.0	.0
Houston	138	157	190	29.88	30.04	.....	56.8	+.9	79	14	67	31	22	47	37	.....	.....	.....	4.08	+.9	16	12.6	se.	34	se.	16	5	10	13	6.5	.0	.0
Palestine	510	64	72	29.51	30.05	−.03	49.2	−2.0	75	9	60	22	21	39	43	44	38	70	4.43	+1.4	11	9.1	s.	43	se.	9	8	6	14	6.2	T	.0
Port Arthur	34	59	134	30.01	30.04	.....	56.3	.....	74	20	64	30	22	48	26	.....	.....	.....	1.92	−1.6	11	15.8	se.	37	s.	19	4	11	13	6.6	.0	.0
San Antonio	693	111	301	29.27	30.00	−.05	54.1	−1.3	83	9	66	30	21	43	44	46	38	61	.95	−.7	8	12.7	e.	35	w.	19	12	7	9	5.0	.0	.0

[1] Observations taken at airport.

TABLE 2.—*Climatological data for Weather Bureau stations, February 1939*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days.	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
							39.0	**+2.9**										**73**	**6.49**	**+3.1**											**6.6**		
Chattanooga	762	71	214	29.28	30.11	−.02	48.6	+4.5	77	19	58	18	22	39	32	43	36	67	12.30	+7.4	15	9.4	se.	30	s.	19	6	8	14	6.4	T	0.0
Knoxville	995	66	84	29.04	30.11	−.01	47.0	+5.1	78	19	58	16	23	36	36	41	35	70	10.69	+6.2	15	6.6	ne.	27	w.	15	10	3	15	6.0	T	.0
Memphis	399	78	86	29.64	30.08	−.03	45.2	+.9	74	9	54	22	22	36	25	41	35	70	10.07	+5.7	12	9.2	e.	33	sw.	28	8	5	15	6.4	T	.0
Nashville	546	168	188	29.52	30.12	.00	44.2	+2.6	72	19	54	16	22	35	42	40	36	75	8.87	+4.7	13	10.9	s.	42	se.	9	6	7	15	6.6	T	.0
Lexington	989	6	.....	.....	.....	.....	39.3	+3.9	75	19	50	11	25	29	40	.....	.....	.....	8.48	+4.9	.....	.....	.....	.....	.....	.....	6	8	14	.....	.....	.....
Louisville	531	188	234	29.52	30.10	−.01	38.2	+1.9	74	19	48	14	23	28	47	34	30	73	6.95	+3.4	16	11.9	s.	41	s.	28	7	6	15	6.6	6.4	.0
Evansville	431	76	116	29.62	30.10	−.01	37.1	+.8	68	9	46	14	4	28	45	33	29	75	6.66	+3.4	16	10.9	n.	37	sw.	28	7	5	16	6.6	13.4	.....
Indianapolis	822	194	230	29.18	30.09	−.01	33.2	+2.1	67	19	42	10	23	24	48	28	22	68	2.97	+.2	14	9.7	sw.	33	w.	10	4	10	14	7.0	8.6	.0
Terre Haute	575	63	149	29.44	30.08	.....	33.6	.....	65	9	43	11	23	24	40	29	24	74	3.62	+1.0	13	11.7	s.	39	se.	9	5	11	12	6.5	7.3	T
Cincinnati	627	11	51	29.40	30.10	.00	35.4	+2.6	74	19	45	8	16	26	44	32	27	75	4.27	+1.3	15	9.6	sw.	35	sw.	28	5	9	14	6.8	11.4	.0
Columbus	822	90	210	29.19	30.09	.00	33.9	+3.2	70	19	43	4	23	25	36	31	26	75	3.92	+1.2	15	11.8	s.	49	s.	28	7	6	15	6.6	9.2	.0
Dayton	900	186	213	29.09	30.08	.....	33.8	+2.4	70	19	43	6	23	25	43	30	26	75	4.38	+1.7	15	12.6	sw.	47	sw.	28	6	8	14	6.6	12.4	.0
Elkins	1,947	65	83	28.02	30.12	+.02	37.6	+6.0	73	19	49	2	23	26	40	33	28	74	5.99	+2.9	19	8.2	w.	27	s.	20	6	5	17	7.1	8.4	.0
Parkersburg	637	77	84	29.39	30.10	.00	38.5	+4.3	75	19	49	6	23	28	34	34	30	77	5.88	+2.8	15	7.8	se.	27	w.	20	8	4	16	6.9	3.9	.0
Pittsburgh [1]	1,273	39	54	28.70	30.08	−.01	34.0	+1.7	67	20	44	4	23	24	36	30	25	76	4.32	+1.7	19	13.6	sw.	47	nw.	20	7	7	14	6.8	8.6	.0
Lower Lake Region							**27.8**	**+2.7**										**78**	**3.55**	**+1.1**										**7.2**		
Buffalo	768	243	280	29.18	30.04	−.02	27.4	+3.1	54	19	35	0	16	20	32	25	21	77	3.50	+.6	17	19.1	w.	59	sw.	26	3	9	16	7.5	15.3	1.0
Canton	448	10	61	29.54	30.04	.....	18.4	+.4	46	28	29	−13	16	8	39	16	14	84	3.24	+1.0	15	11.6	w.	30	w.	27	6	3	19	7.4	16.7	10.6
Ithaca	836	77	100	29.13	30.06	.....	28.8	+4.3	55	20	37	1	16	20	31	26	22	79	3.21	+1.2	11	11.2	nw.	42	se.	28	3	6	19	8.1	8.1	.0
Oswego	335	71	85	29.66	30.05	−.01	26.0	+2.1	56	20	35	−1	16	17	38	24	19	75	4.00	+1.3	16	12.0	se.	34	se.	10	0	5	23	8.9	27.9	2.9
Rochester	523	86	102	29.46	30.06	.00	27.3	+2.7	52	14	35	2	16	29	29	25	21	77	2.67	.0	14	10.8	w.	34	sw.	26	3	10	15	7.8	11.7	.1
Syracuse	596	65	79	29.39	30.05	−.02	28.2	+4.1	61	20	37	2	16	19	41	.....	.....	.....	2.86	+.1	14	8.3	w.	26	se.	10	3	7	18	7.7	12.5	T
Erie	690	57	81	29.26	30.06	−.01	30.2	+3.3	64	19	38	8	16	23	37	27	23	75	4.13	+1.6	17	11.1	s.	38	se.	10	6	5	17	7.1	12.2	.0
Cleveland	762	267	318	29.20	30.05	−.02	32.0	+4.6	68	19	41	8	16	23	35	28	24	74	2.99	+.5	18	18.5	s.	51	sw.	28	8	6	14	6.2	10.2	.0
Sandusky	629	5	67	29.34	30.04	−.03	31.0	+3.6	64	19	40	6	23	22	41	.....	.....	.....	3.43	+1.3	16	11.6	sw.	35	sw.	28	8	4	16	6.5	8.8	.0
Toledo	628	79	87	29.36	30.07	.00	29.0	+1.7	62	19	37	4	23	21	40	26	22	76	4.21	+2.2	14	11.6	w.	35	w.	28	8	8	12	6.1	9.6	T
Fort Wayne	857	69	84	29.11	30.07	.....	29.0	+1.4	61	19	38	2	23	26	47	26	22	79	3.66	+1.3	15	11.9	w.	36	w.	10	6	7	15	6.5	7.8	T
Detroit [1]	626	5	78	29.34	30.04	−.02	26.9	+1.6	56	19	35	6	16	19	34	25	21	81	4.70	+2.5	13	12.6	sw.	37	sw.	10	6	7	15	6.8	10.8	1.0
Upper Lake Region							**18.4**	**−0.3**										**78**	**2.45**	**+0.7**										**6.7**		
Alpena	609	13	89	29.32	30.01	−.02	18.4	+.4	44	28	27	−8	16	10	33	17	13	78	1.81	+.1	14	13.2	nw.	40	se.	9	5	9	14	6.9	9.1	3.6
Escanaba	612	41	49	29.32	30.02	−.04	13.6	−1.8	36	18	23	−12	11	4	40	11	7	71	2.26	+.8	13	12.0	nw.	34	nw.	28	8	3	17	6.6	22.0	17.4
Grand Rapids	707	70	244	29.23	30.03	−.02	27.2	+3.5	53	10	34	9	16	20	40	23	19	75	3.29	+1.0	16	13.7	sw.	53	sw.	10	4	4	20	7.5	11.2	.3
Lansing	878	5	90	29.05	30.03	.....	24.8	+1.9	51	19	33	3	16	16	35	22	20	86	3.15	+1.2	11	10.9	sw.	28	s.	10	4	11	13	6.6	8.7	1.1
Marquette	734	44	69	29.16	30.00	−.05	15.3	−1.0	41	27	24	−9	22	7	39	13	10	82	2.25	+.4	16	9.4	nw.	40	sw.	10	5	9	14	6.6	25.5	20.7
Sault Ste. Marie [1]	724	5	33	29.17	30.00	−.03	11.0	−1.6	38	10	21	−17	16	1	38	9	7	80	3.01	+1.1	21	9.5	w.	38	sw.	10	7	2	19	7.2	31.1	21.2
Chicago	673	7	131	29.30	30.05	−.03	27.6	+1.3	58	19	36	4	22	20	43	24	19	72	1.98	−.2	12	12.1	sw.	36	sw.	10	6	9	13	6.4	5.1	T
Green Bay	617	109	141	29.31	30.02	−.04	16.6	−.8	40	18	26	−10	11	7	42	14	10	76	1.33	−.2	9	12.5	sw.	40	sw.	10	6	5	17	6.8	9.3	4.4
Milwaukee	681	97	221	29.26	30.02	−.04	23.2	+.4	53	19	32	0	11	14	37	20	15	72	2.24	+.4	10	14.7	w.	42	w.	10	8	8	12	6.1	5.8	.2
Duluth	1,133	5	47	28.71	30.00	−.08	6.2	−5.2	38	18	17	−27	15	−5	42	5	2	82	3.20	+2.2	12	16.3	nw.	50	nw.	8	10	3	18	6.0	33.9	27.1
North Dakota							**−1.5**	**−9.3**										**84**	**0.60**	**+0.1**										**5.2**		
Moorhead, Minn	940	50	58	29.02	30.10	−.01	−.8	−8.9	40	17	10	−34	15	−11	43	0	−2	93	.69	.0	6	9.7	n.	24	nw.	10	7	8	13	6.0	13.0	7.0
Lemmon, S. Dak	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bismarck	1,677	8	57	28.22	30.13	+.01	1.5	−8.8	45	18	13	−39	15	−10	51	1	−3	78	.63	+.2	7	8.9	nw.	30	nw.	1	10	12	6	4.8	14.9	1.7
Devils Lake	1,478	11	44	28.42	30.12	+.01	−4.4	−9.5	39	17	6	−35	8	−15	36	−5	−9	85	.36	−.1	10	10.9	nw.	33	ne.	19	10	7	11	5.6	3.7	4.8
Grand Forks	833	12	67	.....	.....	.....	−3.9	−11.5	40	17	7	−38	15	−14	37	−4	−7	.....	.96	+.4	7	10.7	n.	.....	.....	.....	7	9	12	.....	10.2	6.9
Williston	1,878	42	50	28.02	30.12	+.01	.1	−8.0	42	17	12	−37	8	12	45	0	−3	80	.37	.0	5	7.3	n.	22	ne.	19	11	11	6	4.6	4.6	5.8
Upper Mississippi Valley							**24.2**	**−0.7**										**74**	**2.69**	**+1.0**										**5.9**		
Minneapolis-St. Paul, Minn. [1]	848	32	61	29.09	30.05	−.04	9.2	−6.7	43	18	20	−25	11	−2	42	8	4	80	.88	−.1	8	11.5	nw.	34	sw.	2	10	3	15	6.1	11.9	5.4
Springfield, Minn	1,025	4	42	.....	.....	.....	11.1	.....	44	18	21	−23	11	1	40	9	4	.....	1.02	.....	5	9.2	nw.	.....	.....	.....	.....	.....	.....	.....	11.7	.2
La Crosse	714	11	48	29.25	30.06	−.02	17.0	−2.2	45	13	28	−12	11	6	39	14	9	72	2.19	+1.1	10	6.5	s.	20	se.	1	9	8	11	5.4	18.8	13.1
Madison	974	70	78	28.93	30.04	−.03	19.5	+.4	47	13	29	−6	11	10	41	17	13	79	1.75	+.2	8	10.1	nw.	29	ne.	28	8	6	14	6.3	7.3	3.5
Charles City	1,015	10	51	28.92	30.07	−.03	16.0	−1.1	45	18	28	−12	11	6	39	14	10	77	2.42	+1.3	9	8.4	nw.	23	e.	1	11	9	8	4.6	27.3	14.5
Davenport	606	66	161	29.38	30.08	−.0.	25.8	+.9	56	19	36	−2	10	16	38	22	17	70	2.06	+.5	9	12.3	nw.	32	nw.	28	8	8	12	5.8	11.2	1.8
Des Moines	861	5	99	29.12	30.07	−.04	21.4	−2.3	53	18	32	−7	10	11	40	20	15	73	2.33	+1.2	4	11.8	nw.	32	sw.	1	14	6	8	4.4	20.4	14.2
Dubuque	699	60	79	29.27	30.06	−.03	22.4	+.2	52	13	33	−5	10	12	40	19	14	74	2.12	+.7	8	8.1	nw.	24	nw.	28	9	6	13	5.6	13.3	5.4
Keokuk	614	64	78	29.39	30.08	−.03	28.1	−.2	60	13	38	0	10	18	35	24	18	66	1.48	−.1	8	9.5	nw.	32	w.	10	4	10	14	6.9	.9	.0
Cairo	358	87	93	29.69	30.09	−.03	38.8	+.3	71	9	48	15	4	30	36	35	30	76	7.70	+4.6	13	10.9	s.	34	sw.	28	7	5	16	6.6	12.0	.0
Peoria	609	11	45	29.39	30.08	−.02	27.6	+1.7	56	19	37	4	10	18	36	25	23	82	2.88	+.9	10	8.5	nw.	25	sw.	10	10	7	11	5.3	2.9	.0
Springfield, Ill.	636	5	191	29.37	30.06	−.04	30.6	+1.1	60	9	39	8	11	22	37	27	23	76	3.21	+.9	12	12.8	nw.	38	s.	9	8	4	19	7.5	2.9	.0
St. Louis	568	179	303	29.45	30.07	−.04	34.4	−.4	64	9	44	12	21	25	39	30	24	68	3.22	+.7	13	13.4	nw.	34	nw.	9	6	12	10	6.2	8.3	T
Missouri Valley							**23.4**	**−3.3**										**68**	**1.58**	**+0.3**										**5.4**		
Columbia, Mo	784	6	66	29.21	30.07	−.04	31.6	−.1	65	13	41	2	21	22	37	.....	.....	.....	2.45	+.4	9	9.7	s.	24	s.	7	7	10	11	6.2	7.8	.0
Kansas City [1]	750	32	45	.....	30.06	−.05	29.4	−1.8	61	7	41	−1	10	18	42	.....	.....	62	.98	−.8	5	11.5	sw.	36	nw.	7	11	6	11	.....	5.8	2.5
St. Joseph	967	11	49	28.99	30.06	.....	27.0	−2.6	60	7	38	−4	10	16	46	23	16	64	1.26	−.4	6	10.6	nw.	30	nw.	7	12	6	10	4.9	9.9	7.6
Springfield, Mo	1,324	5	78	28.61	30.06	−.05	34.3	−.9	64	13	44	4	21	24	34	30	25	71	3.98	+1.6	10	10.3	se.	32	w.	28	8	8	12	6.0	7.8	T
Topeka	987	65	87	28.97	30.06	.....	28.8	−2.2	64	7	41	−2	21	16	49	24	15	56	1.52	.0	4	10.4	nw.	33	s.	7	11	8	9	4.9	9.3	5.0
Lincoln	1,189	11	81	28.75	30.08	−.02	22.4	−3.7	54	7	34	−11	11	10	50	19	12	66	1.54	+.6	4	11.5	s.	32	sw.	1	15	2	11	4.5	16.4	5.2
Omaha [1]	982	31	44	28.99	30.09	−.02	20.1	−5.4	49	7	32	−12	11	8	44	18	12	70	1.55	+.7	4	13.2	nw.	40	nw.	19	11	5	12	5.4	17.8	5.0
Valentine	2,598	47	54	27.23	30.08	−.01	16.4	−5.0	50	18	28	−17	10	5	45	14	10	77	.66	+.1	8	9.9	w.	32	nw.	1	12	4	12	5.3	8.2	T
Sioux City	1,138	64	106	28.80	30.08	−.04	15.6	−5.4	46	12	27	−13	10	4	42	14	8	70	1.28	+.5	6	11.4	nw.	37	nw.	19	5	9	14	6.4	15.9	2.4
Huron	1,307	59	74	28.63	30.11	−.01	8.4	−5.9	46	18	19	−24	11	−2	45	7	2	73	.55	.0	6	11.0	nw.	32	nw.	19	8	15	5	4.9	10.0	T
Northern Slope							**17.1**	**−5.3**										**70**	**0.71**	**−0.1**										**6.7**		
Missoula	3,238	80	91	.....	.....	.....	24.6	−2.1	46	12	32	−12	9	17	30	.....	.....	.....	1.25	+.5	11	7.2	w.	37	e.	7	1	3	24	9.0	15.8	1.0
Havre	2,507	11	67	27.35	30.13	+.06	10.4	−3.2	48	12	22	−40	10	−1	52	9	4	76	.53	.0	9	8.9	e.	28	sw.	11	7	10	11	6.2	9.0	1.4
Helena	4,124	85	111	25.72	30.08	−.03	19.0	−4.0	48	12	28	−30	9	10	40	16	8	61	.70	.0	11	7.4	nw.	34	w.	16	2	3	23	8.1	13.1	1.0
Kalispell	2,973	48	56	26.91	30.08	.00	21.2	−2.1	43	18	29	−23	9	14	39	19	15	76	.93	−.2	16	5.5	nw.	26	n.	6	3	6	19	7.8	17.0	4.7
Miles City	2,371	48	55	27.48	30.11	+.02	11.0	−5.8	47	12	23	−37	10	−1	60	9	2	65	.34	−.2	7	6.5	s.	25	n.	19	3	7	18	7.5	5.5	.7
Rapid City	3,259	50	58	26.53	30.05	−.03	17.0	−6.4	61	18	29	−26	10	5	56	15	9	73	.35	−.1	8	7.9	n.	32	nw.	1	6	12	10	5.7	5.5	.3
Cheyenne [1]	6,144	5	39	23.76	30.01	−.02	19.2	−8.1	59	18	32	−10	9	7	42	16	10	67	.75	+.1	7	15.2	nw.	44	nw.	15	7	10	11	5.9	12.3	3.0
Lander	5,352	60	68	24.51	30.06	−.02	12.7	−9.8	47	12	26	−24	10	−1	42	11	6	71	1.20	+.6	7	4.7	sw.	41	sw.	6	6	13	9	5.7	14.0	5.3
Sheridan	3,790	10	47	26.01	30.09	.....	15.4	.....	48	17	30	−28	8	1	62	13	7	70	.68	.0	11	5.5	nw.	27	nw.	15	4	13	11	6.2	8.5	2.7
Yellowstone Park	6,241	12	46	23.73	30.14	+.04	12.6	−8.4	36	23	22	−26	9	3	30	10	5	68	.94	+.3	14	8.9	sw.	32	sw.	12	2	12	14	7.0	14.4	5.9
North Platte	2,821	11	51	27.01	30.06	−.01	23.6	−3.0	60	12	36	−10	10	11	44	19	13	70	.15	−.4	5	9.1	w.	31	n.	19	11	8	9	4.9	2.1	T

[1] Observations taken at airport.

TABLE 2.—*Climatological data for Weather Bureau stations, February 1939*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
Middle Slope							**29.4**	**−4.4**										**59**	**1.26**	**+0.4**										**4.4**		
Denver	5,292	106	113	24.58	30.00	−0.01	25.8	−6.9	58	12	37	−2	9	15	36	21	12	59	1.28	+.8	9	8.7	s.	34	ne.	16	10	9	9	5.0	16.3	4.0
Pueblo	4,690	79	86	25.17	29.96	−.04	27.2	−5.7	65	12	40	−2	21	15	43	24	16	61	1.42	+1.0	10	7.8	nw.	32	nw.	18	14	7	7	4.3	17.8	6.2
Chadron, Nebr.																																
Concordia	1,392	50	58	28.54	30.07	−.02	26.6	−3.2	58	23	39	−5	10	14	45	22	15	64	1.17	+.3	5	9.9	n.	29	ne.	27	17	3	8	3.9	9.3	6.0
Dodge City	2,509	10	86	27.34	30.03	−.03	29.1	−4.1	61	12	42	−3	10	16	43	24	13	54	1.30	+.5	6	12.4	n.	36	sw.	19	14	6	8	4.2	14.3	7.0
Wichita	1,358	85	93	28.57	30.06	−.02	30.3	−4.1	62	7	42	−3	21	19	45	26	16	57	1.93	+.7	7	11.4	s.	35	s.	7	16	5	7	3.5	7.7	1.9
Oklahoma City	1,214	10	47	28.72	30.04	−.03	37.4	−2.2	71	13	48	9	21	27	34	31	22	60	.43	−.7	6	11.2	n.	28	nw.	28	11	6	11	5.3	.1	.0
Southern Slope							**43.4**	**−2.6**										**48**	**0.15**	**−0.6**										**3.6**		
Abilene	1,738	10	56	28.18	30.02	−.03	45.2	−2.0	78	9	58	15	21	32	44	36	22	47	.18	−.8	4	11.1	s.	38	w.	27	14	8	6	4.2	T	.0
Amarillo	3,676	10	49	26.18	29.99	−.03	35.4	−2.7	65	15	49	8	3	22	37	27	14	48	.17	−.5	5	10.5	w.	37	sw.	9	17	4	7	3.6	2.4	.0
Del Rio	960	63	71	28.97	29.97	−.03	53.6	−2.4	85	9	65	30	21	42	39	44	32	52	.14	−.4	4	10.6	se.	43	w.	27	14	7	7	4.1	.0	.0
Roswell	3,566	75	85	26.31	29.96	−.02	39.2	−3.3	68	15	55	3	3	23	44	31	16	45	.10	−.5	1	8.9	nw.	36	ne.	16	20	6	2	2.4	1.2	.0
Southern Plateau							**36.4**	**−7.6**										**54**	**0.68**	**−0.2**										**3.5**		
El Paso	3,778	82	101	26.13	29.96	+.01	43.6	−5.4	69	24	58	17	3	30	40	34	19	40	.06	−.3	1	9.2	w.	31	nw.	9	21	6	1	2.1	.5	.0
Albuquerque [1]	5,314	5	39	24.97	29.99	.....	30.0	−10.5	57	15	44	−6	3	16	40	25	16	59	.32	.0	2	9.4	n.	38	w.	9	14	11	3	3.5	3.0	.0
Santa Fe	7,013	38	53	23.09	30.00	+.02	23.6	−9.5	45	23	33	−3	3	14	29	20	12	60	1.08	+.3	8	6.7	n.	21	w.	9	13	6	9	4.6	10.6	2.0
Flagstaff	6,907	10	59	23.21	29.96	−.04	19.5	−11.3	50	23	34	−13	10	5	46	18	...	73	1.52	−.8	6	9.5	sw.	31	sw.	8	10	7	11	5.4	30.5	T
Phoenix	1,107	39	51	28.85	30.03	+.04	48.6	−6.5	76	22	60	28	10	37	41	39	26	48	.89	+.1	6	6.0	e.	30	w.	8	12	12	4	3.8	.5	.0
Yuma	141	9	54	29.91	30.06	+.06	53.2	−5.4	78	23	65	32	10	42	37	42	26	41	.19	−.2	3	7.6	n.	32	n.	16	22	4	2	1.8	.0	.0
Independence	3,957	5	26	29.51	30.04	−.02	37.4	−4.8	66	23	49	14	2	26	39	30	13	...	.33	−.4	3	.....	nw.	.....	.....	...	24	1	3	4.0	.0	.....
Middle Plateau							**25.9**	**−7.6**										**70**	**0.62**	**−0.3**										**5.8**		
Reno	4,527	61	76	25.49	30.11	+.03	32.8	−3.5	56	22	43	10	9	22	30	29	22	63	.23	−1.0	3	7.0	w.	30	w.	19	10	9	9	5.1	1.7	T
Tonopah	6,090	12	20	.....	.....	.....	27.1	.....	54	22	36	6	9	18	26	23	18	72	.16	.....	5	.....	nw.	.....	.....	...	...	...	...	...	2.6	.0
Winnemucca	4,344	18	56	25.64	30.14	+.05	26.8	−6.7	46	24	38	−5	9	16	32	24	19	70	.85	−.1	12	8.8	sw.	28	nw.	6	4	6	18	7.3	13.4	.0
Modena	5,473	10	43	24.55	30.05	+.01	21.0	−10.0	47	23	33	−4	2	9	39	20	14	68	.59	−.4	9	10.2	sw.	38	sw.	8	11	10	7	5.0	14.1	.6
Salt Lake City [1]	4,227	32	46	25.72	30.10	+.02	22.6	.....	39	22	32	−2	2	14	28	22	18	76	1.78	.....	15	9.6	se.	36	nw.	8	4	8	16	6.9	20.1	5.0
Grand Junction	4,602	60	68	25.34	30.02	−.02	22.7	−10.2	42	8	32	−4	2	13	28	20	14	70	.83	+.2	10	5.6	n.	26	w.	9	10	9	9	4.9	9.3	1.0
Northern Plateau							**29.9**	**−2.7**										**71**	**1.47**	**0.0**										**7.3**		
Baker	3,471	36	54	26.45	30.12	.00	26.3	−2.7	47	24	35	−6	9	17	27	24	20	75	.61	−.6	9	6.3	s.	38	sw.	6	3	8	17	7.6	12.6	2.2
Boise	2,739	79	87	27.22	30.15	+.03	30.4	−4.4	47	24	38	9	9	23	25	27	21	66	1.38	−.1	11	6.7	se.	22	nw.	15	7	6	15	6.8	13.9	T
Pocatello [1]	4,466	5	31	25.43	30.11	+.01	21.6	−7.3	37	15	30	1	21	13	28	21	18	82	.89	.....	17	11.2	sw.	39	w.	15	2	7	19	7.9	12.8	3.1
Spokane	1,929	101	110	27.97	30.08	−.01	28.1	−3.2	45	18	36	−9	9	20	35	26	22	78	2.37	+.6	14	6.5	s.	25	sw.	12	7	7	14	6.7	26.3	2.0
Walla Walla	991	57	65	29.01	30.10	−.01	37.4	+.3	58	17	45	5	9	30	39	33	26	65	2.01	+.2	12	6.9	s.	27	w.	15	3	7	18	7.6	7.0	.0
Yakima	1,076	58	67	28.91	30.08	.....	35.4	+.9	54	18	43	14	10	28	26	31	24	61	1.00	.0	9	5.4	nw.	31	nw.	15	5	7	16	7.3	7.1	.0
North Pacific Coast Region							**40.6**	**−1.4**										**80**	**5.21**	**−0.2**										**8.2**		
North Head	211	11	56	29.89	30.13	+.07	41.0	−2.0	54	17	45	28	9	37	17	40	38	90	10.47	+3.0	22	15.7	nw.	57	s.	11	0	6	22	8.7	9.3	.0
Seattle	125	90	321	29.96	30.10	+.04	40.6	−.5	54	17	45	26	10	36	18	38	34	76	3.13	−.8	18	9.6	s.	34	s.	11	2	7	19	8.1	.4	.0
Tacoma	194	172	201	29.90	30.12	+.06	39.8	−.8	56	17	45	22	10	34	22	...	...	...	4.82	+.1	18	8.5	s.	30	n.	6	0	8	20	8.4	2.5	.0
Tatoosh Island	86	9	85	29.98	30.08	+.08	41.0	.0	48	15	44	29	9	38	10	39	36	80	7.23	−2.2	17	14.4	e.	44	s.	11	6	3	19	7.4	4.1	.0
Medford [1]	1,329	29	58	28.77	30.22	.....	39.2	−3.3	62	21	48	24	20	31	37	36	32	77	1.25	−1.1	11	.....	nw.	.....	.....	...	2	9	17	7.6	4.4	.0
Portland, Oreg	154	68	106	29.99	30.16	+.08	40.8	−1.3	53	21	46	24	9	36	19	38	34	77	5.26	−.1	19	6.8	s.	24	s.	11	1	4	23	8.7	5.4	.0
Roseburg	510	45	76	29.64	30.21	+.11	41.7	−1.7	59	21	49	25	20	35	29	39	35	78	4.34	−.2	19	4.6	s.	28	sw.	6	2	4	22	8.3	3.3	.0
Middle Pacific Coast Region							**47.3**	**−2.5**										**64**	**2.25**	**−2.8**										**5.4**		
Eureka	60	72	88	30.17	30.24	+.13	44.4	−2.8	59	17	50	31	1	38	21	42	39	81	4.41	−2.1	13	8.6	n.	29	n.	27	7	6	18	6.8	T	.0
Redding [1]	722	20	34	.....	.....	.....	45.8	−3.9	73	17	55	28	8	37	28	38	26	51	1.60	−5.0	6	8.1	nw.	28	nw.	27	11	3	14	5.7	5.5	.0
Sacramento	69	92	115	30.08	30.16	+.07	47.9	−2.2	73	17	58	30	9	38	29	42	33	59	1.06	−2.0	8	9.2	n.	29	n.	17	11	9	8	5.0	.0	.0
San Francisco	155	112	132	29.99	30.16	+.06	51.2	−1.0	75	17	58	39	8	45	24	45	39	66	1.94	−1.9	7	8.2	w.	24	w.	7	11	9	8	4.5	.0	.0
South Pacific Coast Region							**51.4**	**−2.5**										**59**	**1.04**	**−1.1**										**4.1**		
Fresno	327	97	105	29.79	30.16	+.08	47.7	−3.4	69	21	57	32	9	38	31	43	35	65	.77	−.7	6	5.8	nw.	21	nw.	8	9	10	9	5.3	T	.0
Los Angeles	338	159	191	29.73	30.10	+.04	54.0	−1.5	76	15	62	38	2	46	28	45	33	52	1.13	−1.9	6	7.3	ne.	30	nw.	16	19	5	4	2.9	T	.0
San Diego	87	62	70	30.00	30.10	+.04	52.4	−2.7	69	22	60	36	2	45	25	46	37	60	1.23	−.8	7	7.2	w.	29	w.	8	15	6	7	4.0	.0	.0
West Indies																																
San Juan, P. R	82	9	54	29.98	30.07	.....	74.0	−.9	82	15	78	66	1	70	14	...	...	...	2.52	−.2	18	13.7	e.	34	e.	10	9	18	1	4.6	.0	.0
Panama Canal																																
Balboa Heights	118	6	92	.....	[3]29.87	+.02	78.5	−1.8	91	26	88	67	23	70	22	...	...	[3]71	T	−.6	0	9.7	nw.	26	n.	12	19	9	0	3.3	.0	.0
Cristobal	36	6	97	.....	[3]29.91	+.02	79.9	−.9	85	27	83	73	16	76	10	72	69	[3]72	.50	−1.0	11	14.2	n.	26	n.	13	8	15	5	4.8	.0	.0
Alaska																																
Fairbanks	454	11	87	.....	[3]30.01	.....	−2.9	−2.1	39	23	8	−51	6	−14	31	...	...	80	.27	−.2	4	4.0	w.	15	n.	10	9	7	12	.....	4.9	17.5
Juneau	80	96	116	[3]29.90	[3]29.99	.....	26.5	−3.7	41	17	30	3	6	24	10	25	20	76	8.42	+3.0	23	8.3	s.	31	n.	7	4	0	24	8.6	19.1	T
Nome	22	5	32	.....	[3]29.76	.....	13.0	+7.8	33	15	20	−20	5	6	36	...	...	83	.95	+.1	16	12.6	ne.	36	n.	10	5	4	19	.....	10.7	25.4
Hawaiian Islands																																
Honolulu	38	86	100	29.98	30.02	.....	73.1	+2.3	80	18	78	64	8	69	14	67	64	76	3.60	−.2	13	8.6	e.	23	e.	6	4	14	10	6.0	.0	.0

[1] Observations taken at airport. [2] Observations taken hourly. [3] Pressure not reduced to a mean of 24 hours.

TABLE 3.—*Data furnished by the Canadian Meteorological Service, February 1939*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max.+ mean min. ÷2	Departure from normal	Mean maximum	Mean Minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*° F.*	*° F.*	*° F.*	*° F.*	*° F.*	*° F.*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99												
Sydney, Cape Breton Island	48	29.90	30.05	+0.14	20.8	+1.0	31.1	10.6	52	−2	4.89	+0.48	14.1
Halifax, Nova Scotia	88	29.77	30.06	+.11	24.8	+1.8	33.3	16.4	50	5	6.49	+2.08	8.9
Yarmouth, Nova Scotia	65	29.94	30.06	+.10	29.0	+3.6	37.3	20.6	48	9	4.53	+.23	14.4
Charlottetown, Prince Edward Island	38	29.96	30.05	+.13	17.0	+.4	26.1	7.9	33	−2	2.82	−.45	10.5
Chatham, New Brunswick	28	29.91	30.02	+.07	11.5	−2.1	22.6	.4	55	−21	2.53	−.19	16.7
Father Point, Quebec	20	30.04	30.05	+.09	8.9	−1.5	17.0	.8	35	−13	3.36	+1.40	33.6
Quebec, Quebec	296												
Doucet, Quebec	1,236	29.66	29.99	−.03	−.8	−.6	13.9	−15.5	35	−48	2.45	+.87	24.5
Montreal, Quebec	187												
Ottawa, Ontario	236												
Kingston, Ontario	285	29.72	30.05	−.01	18.9	+2.1	28.2	9.6	41	−12	3.23	+1.04	23.4
Toronto, Ontario	379	29.61	30.04	−.03	24.8	+4.3	32.3	17.3	46	−7	3.62	+1.14	19.9
Cochrane, Ontario	930	28.93	30.02	−.07	−1.5	−5.1	10.2	−13.2	34	−37	3.59	+2.68	35.9
White River, Ontario	1,244	29.58	30.02	−.04	−3.4	−.6	12.9	−19.7	36	−52	3.78	+2.53	37.8
													37.8
London, Ontario	808	29.13	30.04	−.06	23.6	+3.8	31.7	15.5	45	−4	4.82	+1.38	14.4
Southampton, Ontario	656	29.27	30.00	−.02	20.6	+1.0	28.4	12.9	44	−9	3.67	+.83	16.5
Parry Sound, Ontario	688	29.30	30.03	−.04	16.0	+2.9	23.0	7.0	42	−20	5.94	+3.06	57.7
Port Arthur, Ontario	644	29.29	30.05	−.03	.9	−8.1	12.3	−10.5	30	−30	3.55	+2.84	35.5
Winnipeg, Manitoba	760	29.22	30.14	−.05	−9.0	−10.6	.2	−18.1	32	−38	1.48	+.64	14.8
Minnedosa, Manitoba	1,690	28.19	30.11	−.04	−7.7	−7.9	1.8	−17.2	41	−44	.79	+.22	7.9
Le Pas, Manitoba	860	29.14	30.21	+.04	−17.8	−18.7	−5.0	−30.6	24	−53	.46	−.07	4.6
Qu'Appelle, Saskatchewan	2,115	29.70	30.16	.00	−7.6	−12.0	2.6	−17.8	43	−41	1.44	+.69	14.4
Moose Jaw, Saskatchewan	1,759	28.03	30.15	−.02	−2.6	−9.7	7.1	−12.4	42	−38	.38	−.10	3.7
Swift Current, Saskatchewan	2,392	27.11	30.12	−.03	−1.2	−9.9	8.8	−11.1	38	−43	.54	−.05	5.4
Medicine Hat, Alberta	2,365	27.49	30.14	+.01	2.0	−13.5	12.2	−8.1	40	−49	.81	+.23	8.1
Calgary, Alberta	3,540	25.24	30.15	+.04	5.1	−9.4	16.7	−6.5	48	−42	.63	+.05	6.3
Banff, Alberta	4,521												
Prince Albert, Saskatchewan	1,450	28.53	30.22	+.07	−9.6	−11.0	1.7	−21.0	41	−42	.48	−.11	4.8
Battleford, Saskatchewan	1,592	28.32	30.20	+.05	−9.4	−8.7	1.9	−20.6	41	−45	.54	+.17	5.4
Edmonton, Alberta	2,150	27.73	30.18		1.3	−10.3	9.2	−6.6	46	−44	1.90	+1.24	19.0
Kamloops, British Columbia	1,262												
Victoria, British Columbia	230	29.82	30.08	+.05	39.1	−1.3	43.8	34.4	50	24	3.54	+.37	2.6
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20												
Prince Rupert, British Columbia	170												
St. George's, Bermuda	158		30.25	+.14	64.0	+2.2	69.2	58.8	74	55	1.78	−3.01	.0

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Cape Race, Newfoundland	99				23.6	−1.4	30.8	16.4	39	0	5.09	+0.45	22.2
Quebec, Quebec	296	29.62	29.96	−0.08	11.1	+1.4	19.0	3.2	40	−18	3.00	−.83	20.7
Doucet, Quebec	1,236	29.58	30.02	−.02	−.6	+1.8	14.0	−15.1	40	−48	1.53	−1.15	15.0
Banff, Alberta	4,521	25.15	29.85	−.03	22.4	+9.0	29.9	14.8	40	−10	1.52	+.12	5.3
Battleford, Saskatchewan	1,592	28.12	29.94	−.18	8.8	+12.6	16.6	.9	35	−19	.61	+.08	5.4
Kamloops, British Columbia	1,262	28.63	30.01	−.12	31.4	+9.6	36.3	26.6	49	11	1.85	+.85	18.1
Estevan Point, British Columbia	20	29.92	29.95	−.04	42.4	+2.2	46.3	38.5	51	28	18.36	+5.94	.0
Prince Rupert, British Columbia	170	29.58	29.77	−.10	39.6	+4.4	43.4	35.9	50	28	10.55	+.83	.6

TABLE 4.—*Severe local storms, February 1939*

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Carthage, Ill	1				$800	Electrical	Barn burned.
Knoxville, Tenn	2-3				5,000	Heavy rain	First Creek out of its banks flooding 5th Ave. underpass. 40 homes uninhabitable for several days. Amount of damage to city streets not estimated.
Philadelphia, Miss., 10 miles northwest.	3	3 a. m.			20,000	Thundersquall	9 persons injured; 5 residences demolished.
Johnston, S. C., and vicinity	3	3 p. m.	[1] 2		2,000	Thunderstorm	Residence and several roofs damaged.
Columbia, S. C., and vicinity	3	3:25 p. m.	100	0	131,000	Tornado	Storm first observed 5 miles from West Columbia, where a tenant house was wrecked and 60 trees uprooted. The Brookland-Cayce School was next struck; part of the roof was torn off, windows broken, and the upper walls damaged. The storm lifted in open, level country to cross the depression of the Congaree River and began to descend at Pulaski and Blossom Sts. Roofs of 2 buildings of South Carolina University were damaged and part of the grandstand demolished in Melton Field. 6 persons were injured; 53 families homeless; 35 small frame houses demolished; 3 cotton warehouses and other buildings and about 100 tenant houses damaged. Telephone and power lines flattened; path 10 miles long.
Union City, Ga	6	Noon		0	8,000	do	Damage mostly to factory machinery and material.
South Dakota	8-10					Wind and snow	Traffic by trains and cars delayed or stopped, because of much drifting. Schools closed on the 10th.
Keokuk, Iowa	9	2:05 p. m.				Thundersquall and hail.	Motorists used lights because of reduced visibility. Temperature drop from 43° to zero in 12 hours.
Greenbrier, Ark., vicinity of	9	8 p. m.		0	3,000	Tornado	House destroyed, 2 others damaged; path narrow.

[1] Miles instead of yards.

TABLE 4.—*Severe local storms, February 1939*—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Servier, Howard, and Pike Counties, Ark.	9	8 p. m.		0	$25,000	Tornado	3 persons injured; church and several houses destroyed; buildings damaged; trees uprooted; path narrow to 200 yards wide and 25 miles long.
Doniphan to St. Louis, Mo.	9	8–11 p. m.			59,325	Tornadic wind	5 persons seriously injured; much timber uprooted. Property damage $56,325; loss to crops and fruit trees $3,000.
Arenzville, Ill.	9				2,600	Electrical	Cattle, barn, and contents burned.
Astoria, Ill.	9				3,000	Heavy hail	Property damaged.
Monmouth, Ill., 6 miles northeast of.	9				4,000	Electrical	Barn burned.
Alexander, Madison, Vermillion, Perry, Hardin, Montgomery, Piatt, Christian, Randolph, and Clinton Counties, Ill.	9				36,000	Wind	Property damaged.
Sesser, Ill.	9				5,000	Heavy hail and wind.	Do.
Terre Haute, Ind.	9				2,000	Wind	Poles, wires, and smokestacks damaged.
Tyler, Tex.	9				3,000	Straight-line wind.	Property damaged; 1 person injured.
Concord, N. H.	10	9:30 a. m.				Sleet and glaze	Steady fall of sleet during most of the day changed to glaze in late afternoon. Street and walks hazardous; wires and trees heavily coated.
Alpena, Mich.	10	A. m.				Ice and wind	Traffic slowed, some rural buses unable to make their trips, others considerably delayed.
Iroquois, Edgar, Moultrie, Shelby, Woodford, and Christian Counties, Ill.	10				58,865	Wind	Property damaged; 7 persons injured in Shelby County.
Springfield, Ill.	10				5,000	do	Hangar and several airplanes damaged.
Johnson County, Ind.	10				7,100	do	Damage to poles, wires and buildings.
New York State; western, central, and northern portions.	10				100,000	do	Much damage to trees; wires, roofs, buildings, and plate glass windows. Amount given estimated damage in Jefferson and St. Lawrence Counties only.
Macon, Ga., vicinity of	14	6:45 p. m.	100		50,000	Tornadic wind	25 persons injured; property damaged; path 15 miles long.
Tullahoma and Manchester, Tenn.	14	11 p. m.-midnight.			50,000	do	60 or more trees blown down and a number of buildings damaged on the grounds of the State Girls' Vocational School near Tullahoma. In the vicinity of Manchester, 5 tobacco barns blown down.
Plain Dealing, La.	14				500	Wind	Several farm buildings unroofed or destroyed.
Greenville, S. C., and vicinities.	15	6:05 a. m.			20,000	Squalls	Several trees uprooted; house demolished and 3 persons injured. In addition, 2 steel towers carrying high voltage and house demolished; the wreckage being scattered over about 9,680 square yards giving some evidence of tornadic action.
Liberty, S. C., vicinity of.	15	6:30 a. m.	880	0	5,000	Tornado	1 person injured; 2 residences demolished, 5 damaged; outbuildings unroofed; trees uprooted.
Bartow, Fla.	15	3 p. m.		0	750	do	Property damaged; considerable fruit blown from trees; path narrow and from 3 to 4 miles long.
Jefferson County, Ala.	15			1	6,000	do	4 persons injured; property damaged.
Limestone and Morgan Counties, Ala.	15			1	20,000	Wind	Property damaged.
Bath, Pa.	15		8—13	0	10,000	Tornado	Do.
Buena Vista, Va.	15				3,250	Straight-line wind.	Do.
Los Angeles, Calif., and vicinity.	15–17					Wind	Heavy damage to roofs, trees, and citrus fruits particularly in the Pasadena area.
Pueblo, Colo., and vicinity.	16	5:30 a. m.			15,000	Snow, wind, and dust.	Visibility reduced to a mile; damage to roofs, signs, and plate-glass windows.
Morgan County, Ala., southwestern portion.	19				2,000	Wind	Property damaged.
Parkersburg, W. Va., and vicinity.	19	Midnight.				do	Church unroofed; several houses and garages damaged.
Denver, Colo., and vicinity.	19–20	P. m.				Snow and ice	Motorists marooned on highways for several hours.
Detroit, Mich.	19–20					Heavy rain and flood.	Streets and basements flooded; several highways unsafe for travel. The Rouge River forced out of its banks. 35 homes surrounded by water; more than 40 persons rescued.
Lancaster, N. Y., and vicinity.	19–20				45,000	Flood	Rains and much water from melted snow caused many creeks and rivers in western New York to overflow. Streets and cellars flooded; some property damage.
Clay County, Ala., eastern portion.	20			1	2,000	Tornado	10 persons injured; property damaged.
Windsor, N. C., vicinity of.	21	6:30 p. m.	400	4	75,000	do	35 persons injured; property damaged mostly to farmhouses and barns; path 4 miles long.
Parkersburg, W. Va.	21–22					Snowfall	Traffic impeded; several accidents reported because of slippery streets.
Nokomis, Ill.	24				500	Wind	Property damaged.
Call, Tex.	25	10:30 a. m.		0	6,000	Tornado	Property damaged; 1 person injured.
Blakely and Edison, Ga.	25	11:30 p. m.		1	12,000	do	Several persons injured; property damaged.
Port St. Joe, Fla., east of.	26	2:30 a. m.	167		500	Tornadic winds	First damage to palms along the highway at St. Josephs Bay. 2 persons injured; 2 houses demolished; path 20 miles long.
Elloree, S. C., vicinity of.	26	10 a. m.	20–220		500	Squall	Barn blown over; outbuildings damaged; path 1½ miles long.
Moniac, Ga., 2 miles southeast.	26	10:30 a. m.		0	3,000	Tornado	25 persons injured; damage to household goods and farm implements.
La Fourche Parish, La., northern portion, to Lake Borgne.	26		[1] 10		200,000	Hail and wind	Crops loss, $50,000; property damage mostly in New Orleans and suburbs, $150,000; path 50 miles long.
Sanatorium, Miss., vicinity of.	27	8:30 p. m.	100		150,000	Tornadic winds	7 persons injured; property damaged; path 8 miles long.
Charles City, Iowa.	27–28					Snow	17.5 inches, reported to have been the greatest 24-hour fall for this station, recorded from 5:30 p. m., of the 27th to 1:30 p. m., of the 28th. Schools closed for the day.
Des Moines, Iowa.	27–28					do	14.2 inches of snow recorded in 10½ hours. Streets and highways blocked; transportation delayed; hundreds of automobiles stalled.
Dodge City, Kans.	27–28					Snow and wind	Blizzard conditions existed most of the afternoon and evening of the 27th and early morning of the 28th. Streets and highways blocked.
Wichita, Kans.	27–28					Rain and snow	Rain began shortly before 5 a. m., of the 27th, changed to snow, 4:50 to 5:30 p. m. Visibility reduced to 880 yards. Motor traffic difficult off the main highway.
St. Joseph, Mo.	27–28					Snow	Fall of 9.2 inches recorded with damage to trees and wires. On some branch railroad traffic was delayed more than a day. The main highways not cleared for travel for 2 days.
Dayton, Ohio.	28					Wind	Damage to power and telephone wires; minor damage to buildings.

[1] Miles instead of yards.

U. S. GOVERNMENT PRINTING OFFICE: 1939

Chart I.—Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, February 1939

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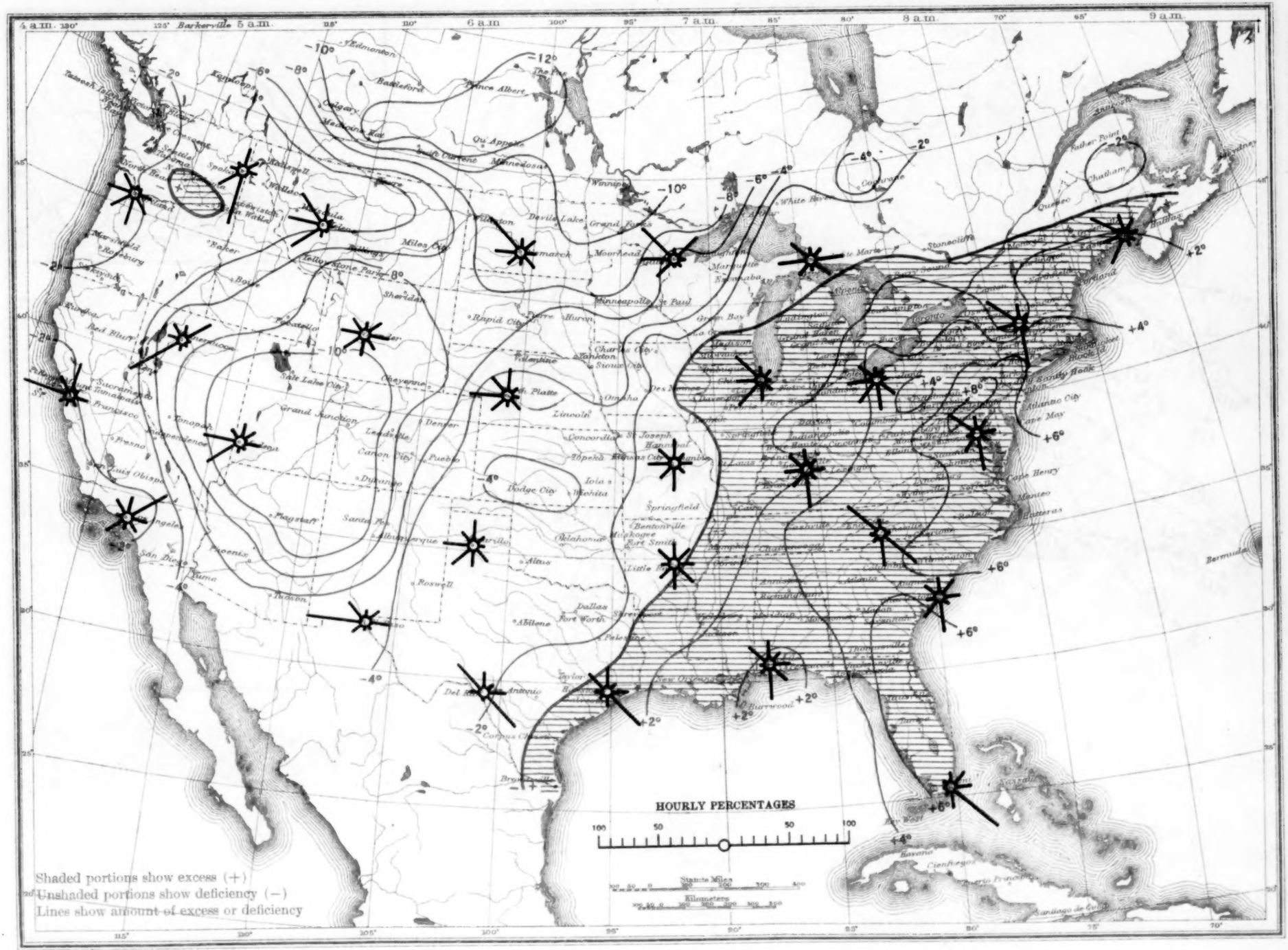
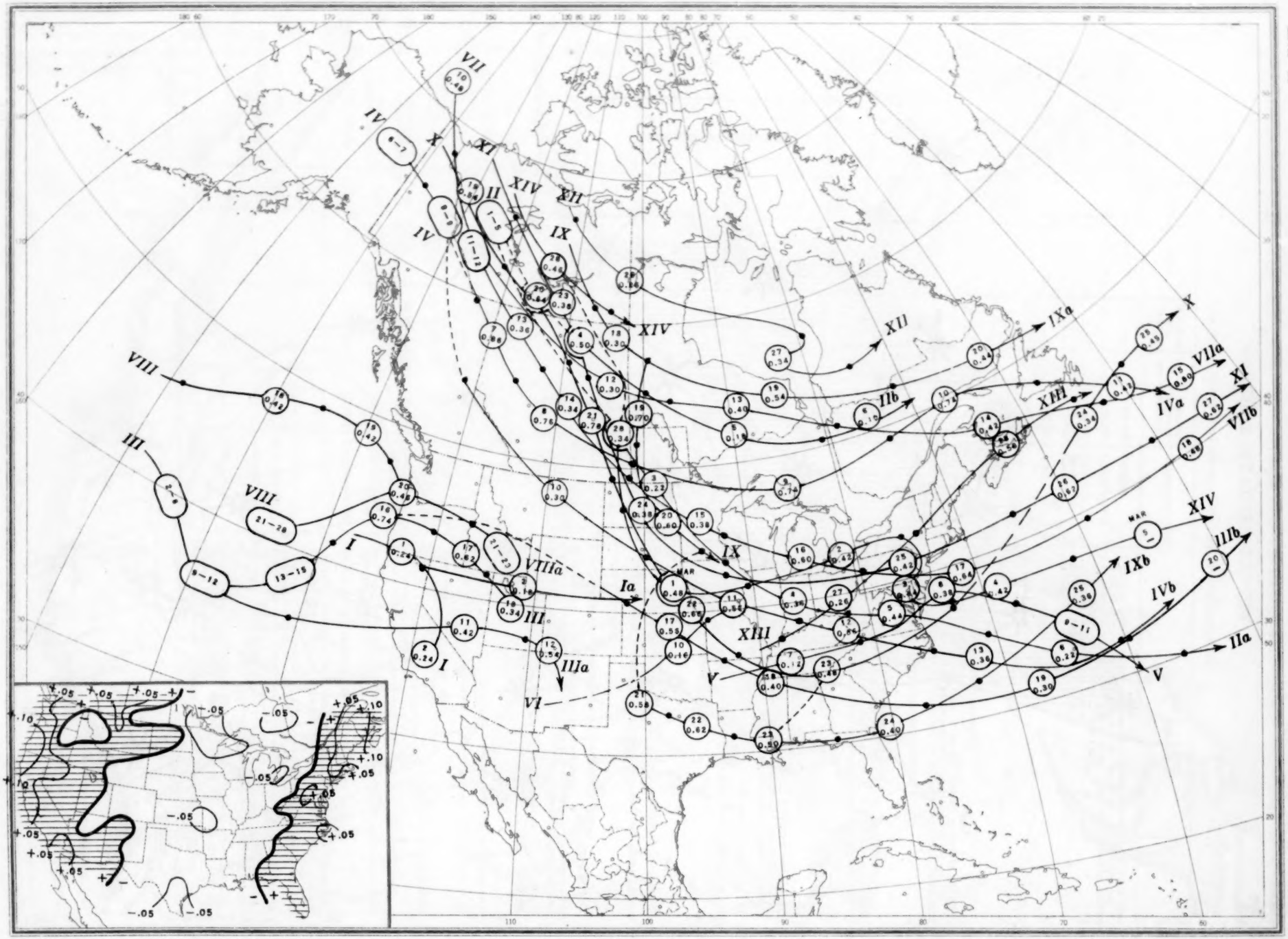


Chart II. Tracks of Centers of Anticyclones, February 1939. (Inset) Departure of Monthly Mean Pressure from Normal



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, February 1939. (Inset) Change in Mean Pressure from Preceding Month

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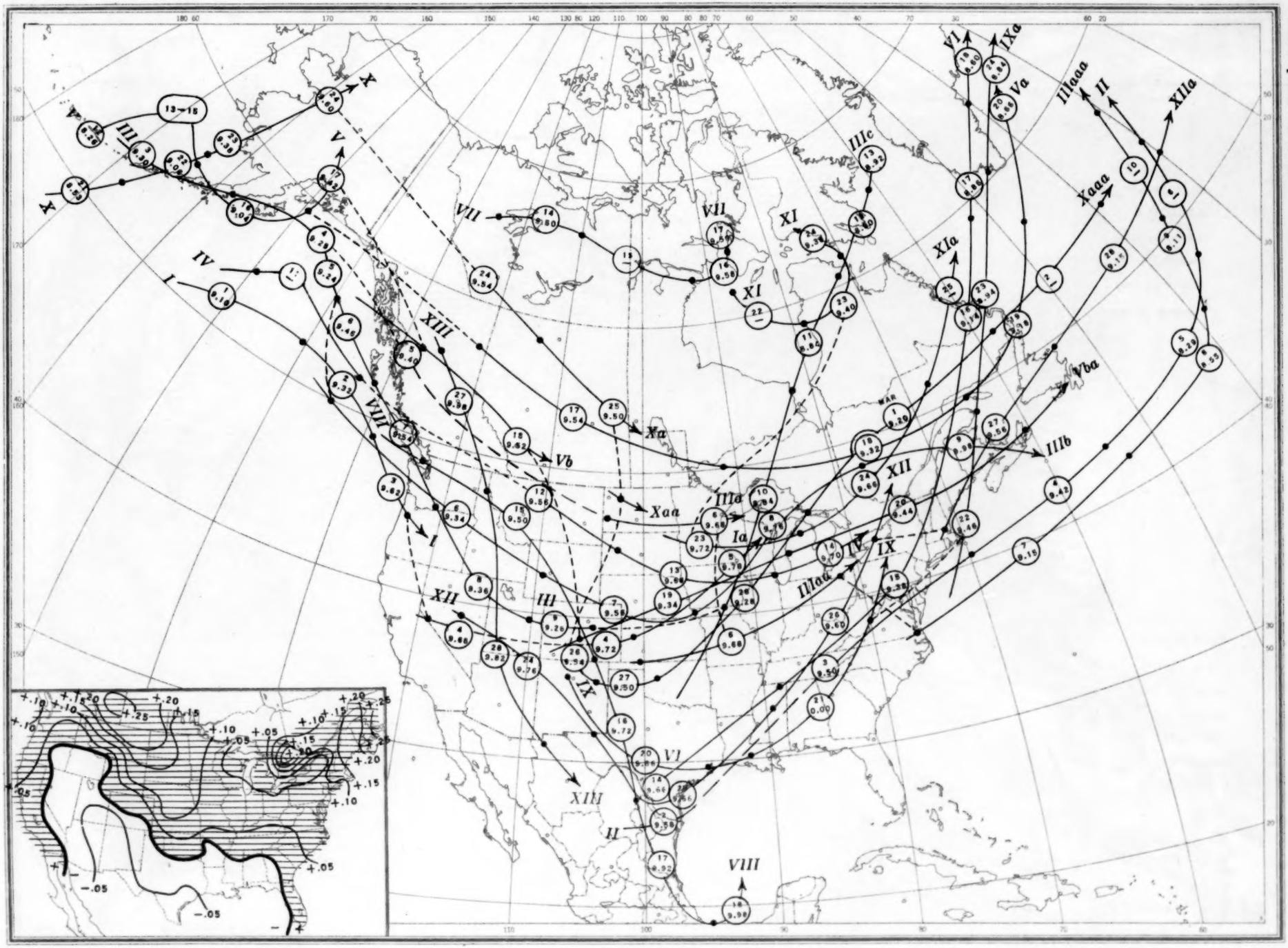

Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, February 1939

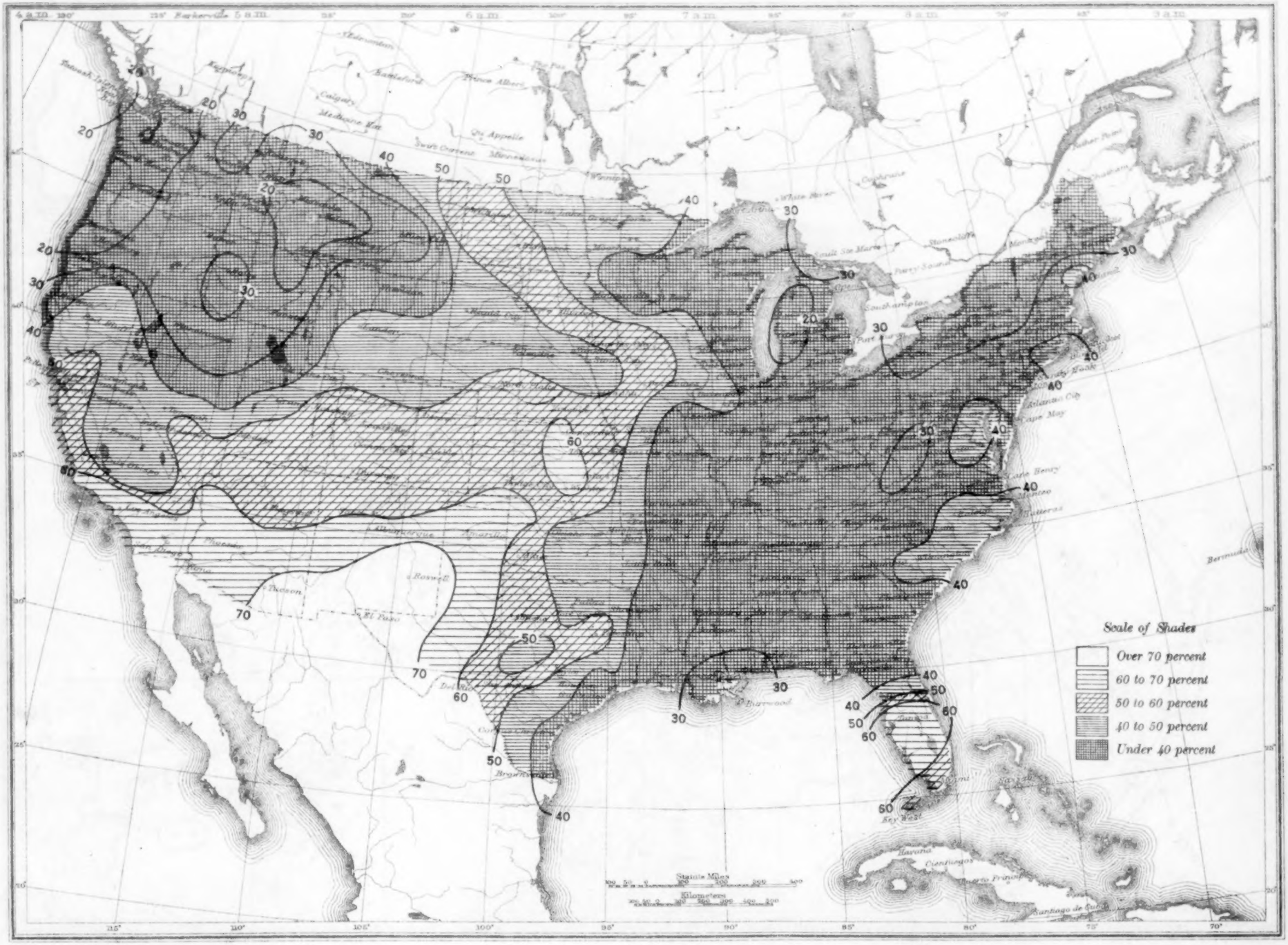

Chart V. Total Precipitation, Inches, February 1939. (Inset) Departure of Precipitation from Normal

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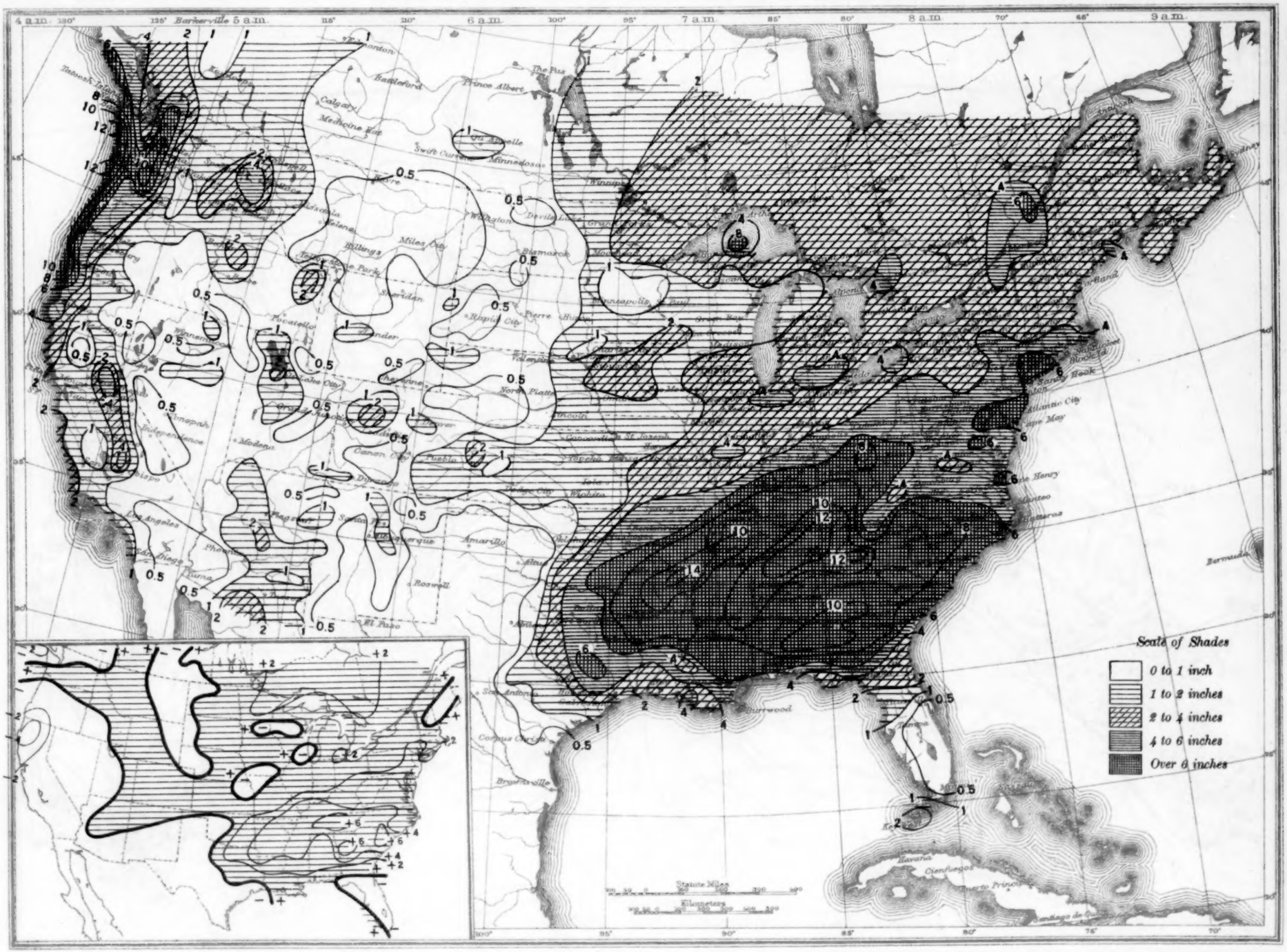

Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, February 1939

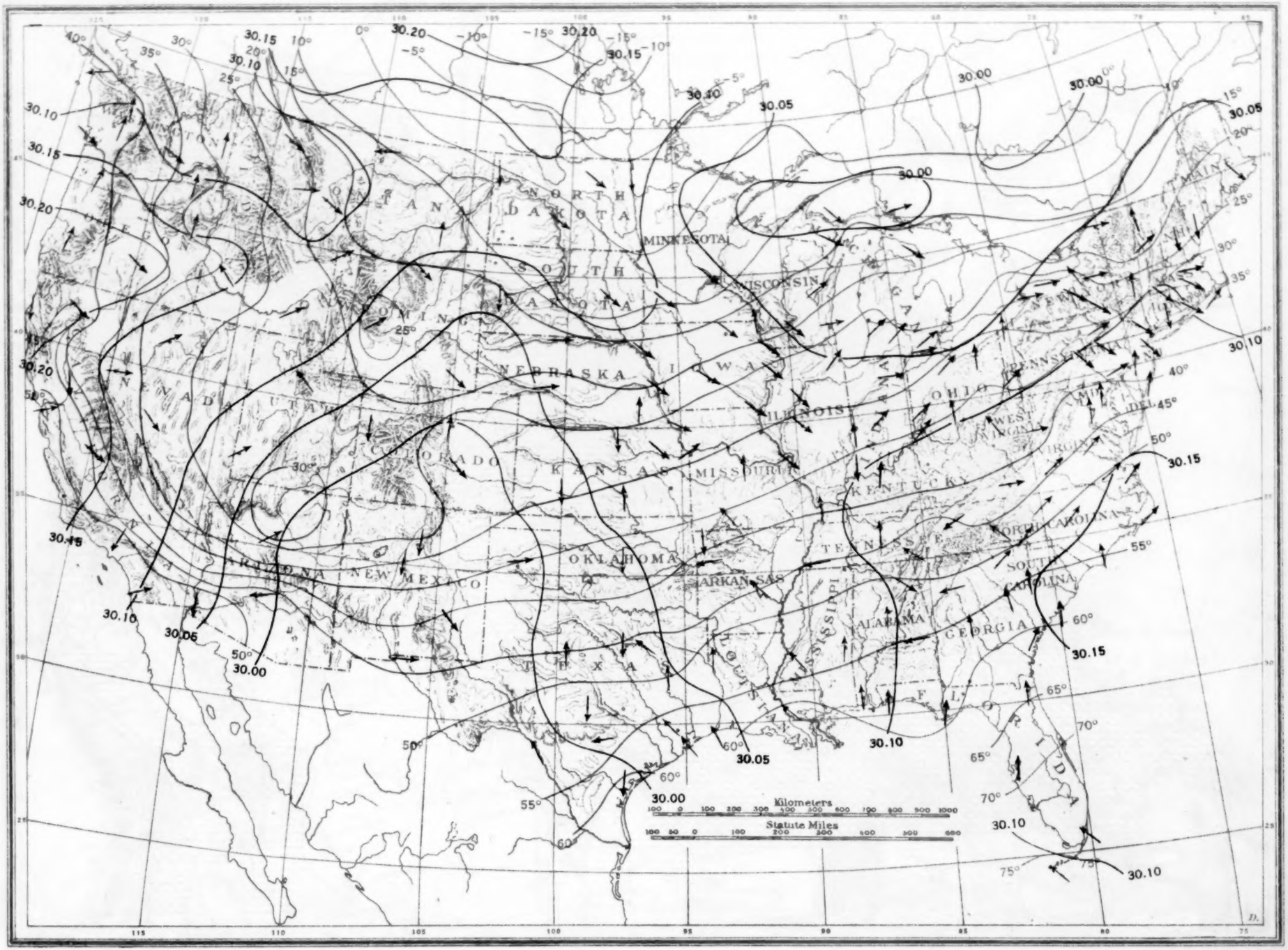

Chart VII. Total Snowfall Inches February 1939. (Inset) Depth of Snow on the Ground at 7:30 a. m. Monday Feb. 27 1939

Chart VII. Total Snowfall, Inches, February 1939. (Inset) **Depth of Snow on the Ground at 7:30 p.m., Monday, Feb. 27, 1939**

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) February 1939

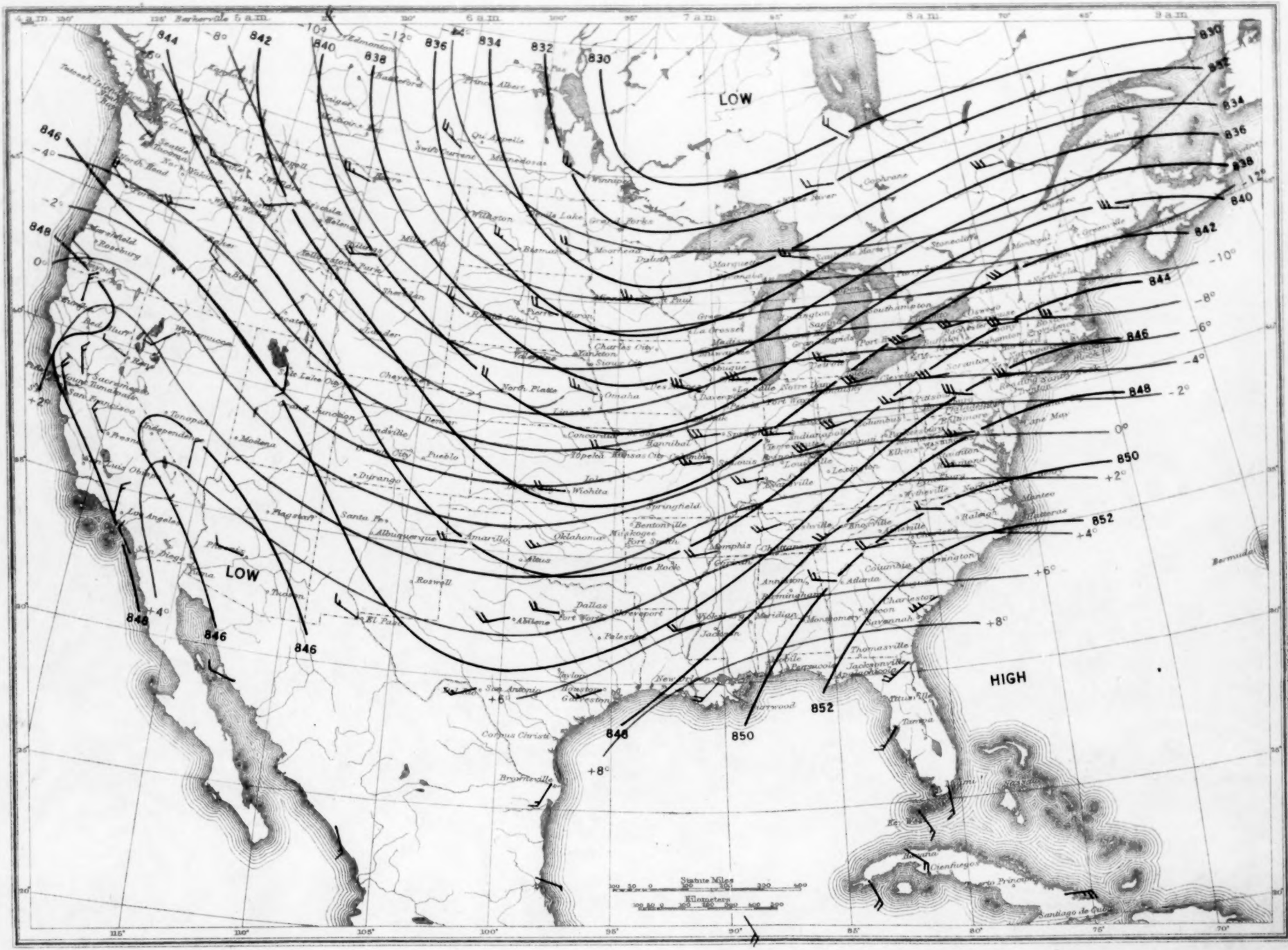

Chart IX. Isobars (mb) Isotherms (°C.) and Resultant Winds for 3,000 Meters (m. s. l.) February 1939

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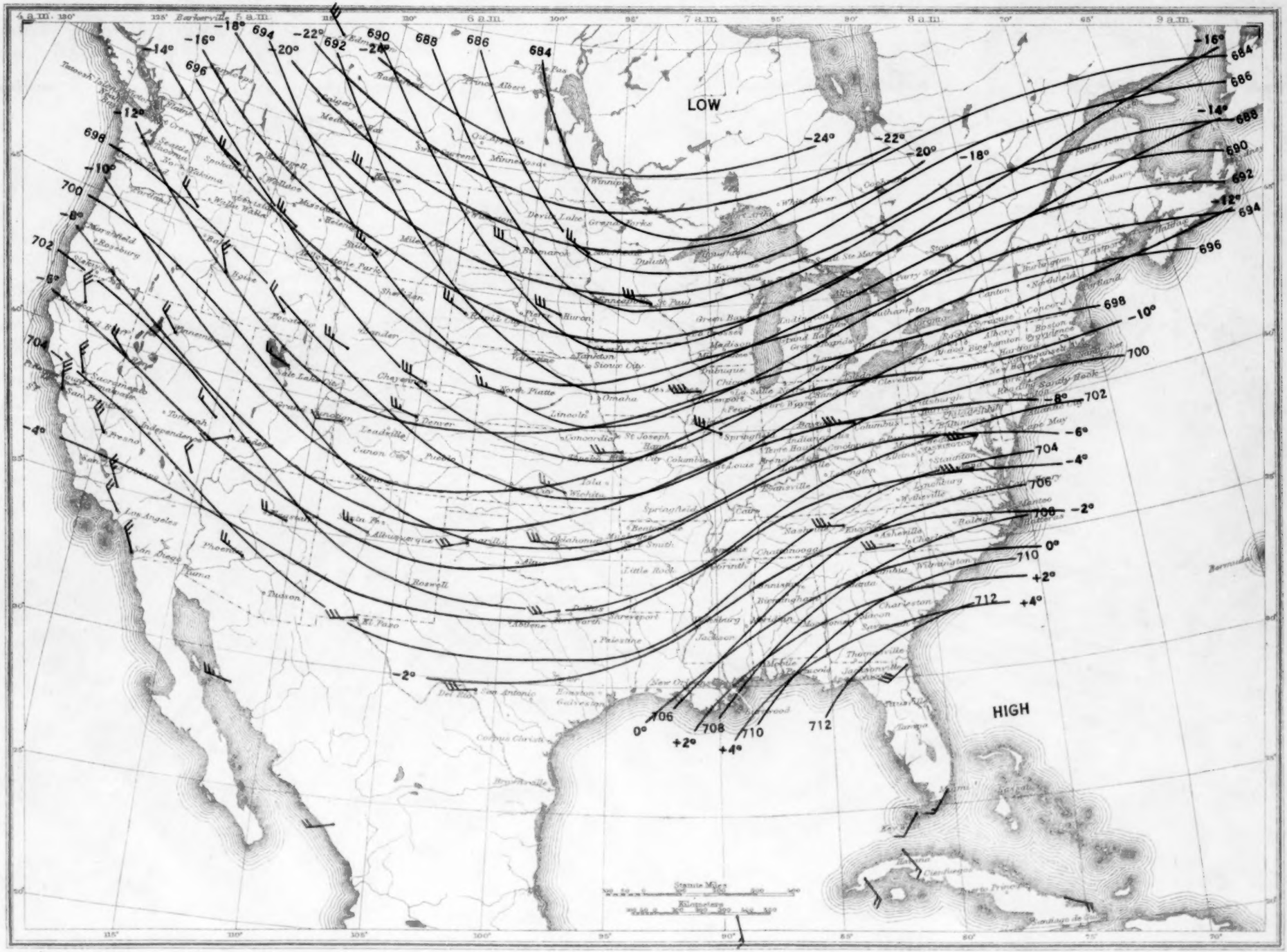

Chart X. Isobars (mb) Isotherms (°C.) and Resultant Winds for 4,000 Meters (m. s. l.) February 1939

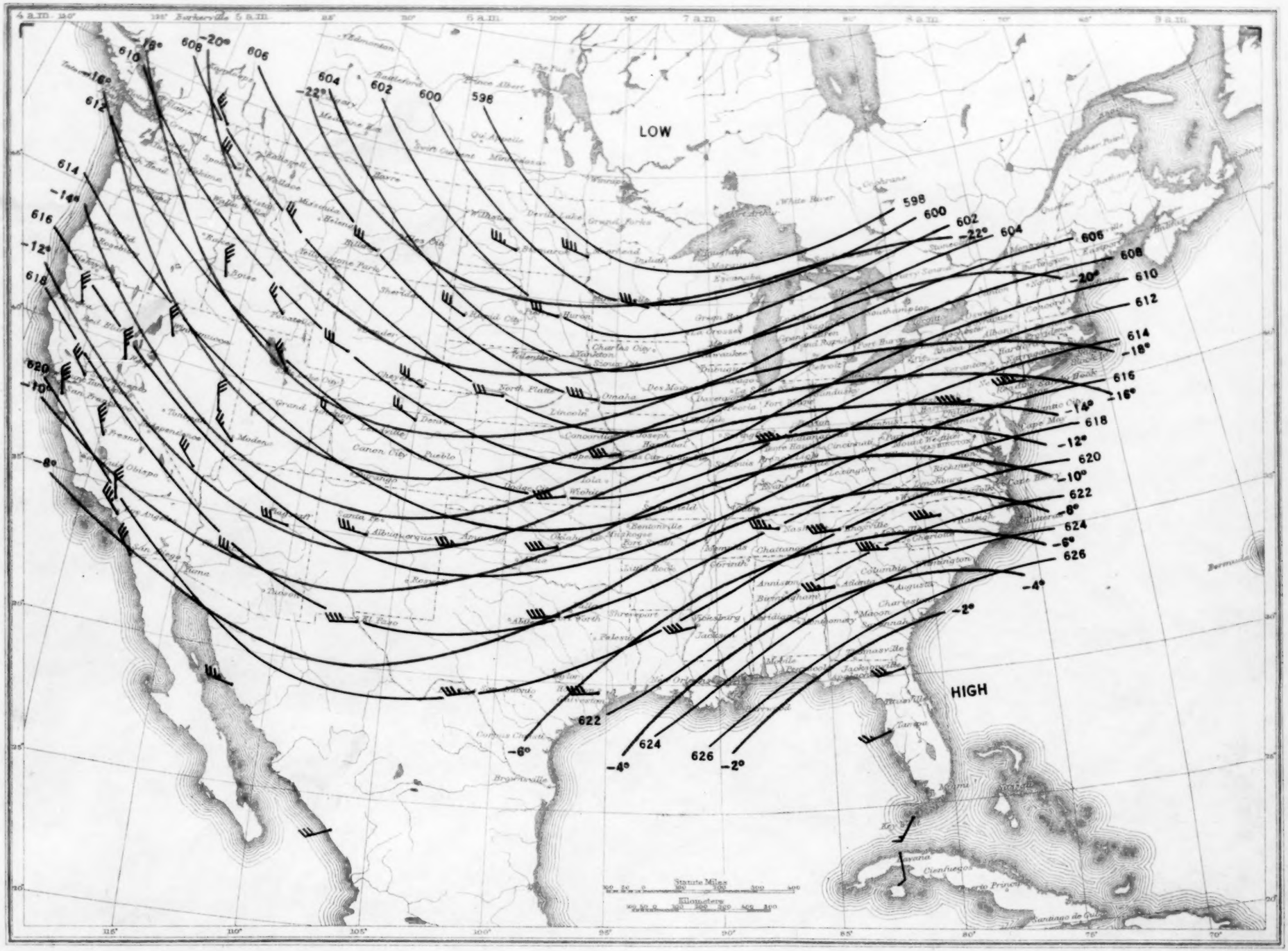

Chart XI. Isobars (mb) Isotherms (°C.) and Resultant Winds for 5,000 Meters (m. s. l.) February 1939

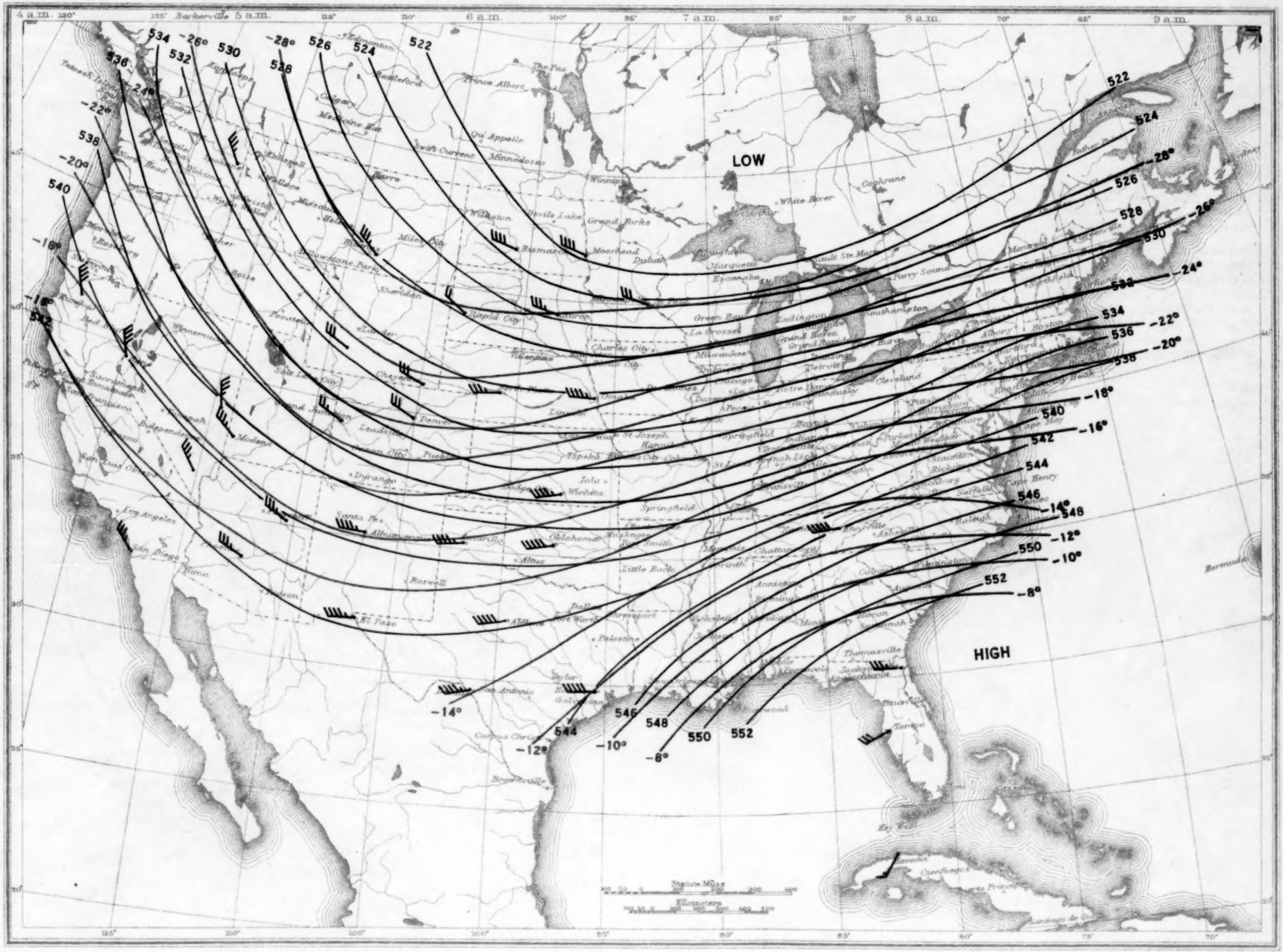

Chart XII. Mean Isentropic Chart, February 1939 (Potential Temperature 292° A.)

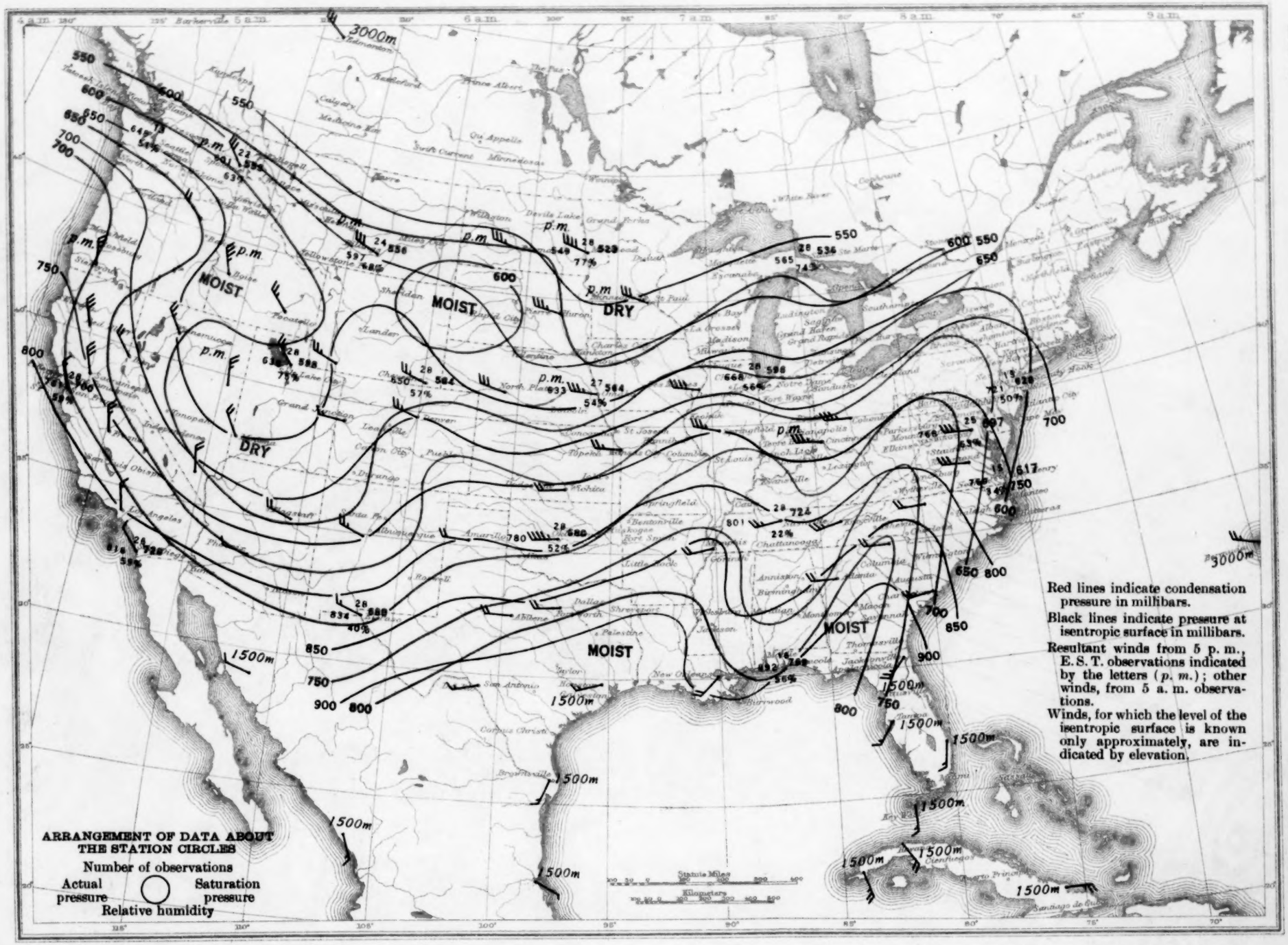
MOIST
DRY
MOIST
DRY
MOIST
Red lines indicate condensation pressure in millibars.
Black lines indicate pressure at isentropic surface in millibars.
Resultant winds from 5 p. m., E. S. T. observations indicated by the letters (p. m.); other winds, from 5 a. m. observations.
Winds, for which the level of the isentropic surface is known only approximately, are indicated by elevation.
ARRANGEMENT OF DATA ABOUT THE STATION CIRCLES
Number of observations
Actual pressure
Saturation pressure
Relative humidity
Statute Miles
Kilometers

Chart XIII. Weather Map of North Atlantic Ocean, February 16, 1939

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(Plotted from the Weather Bureau Northern Hemisphere Chart)

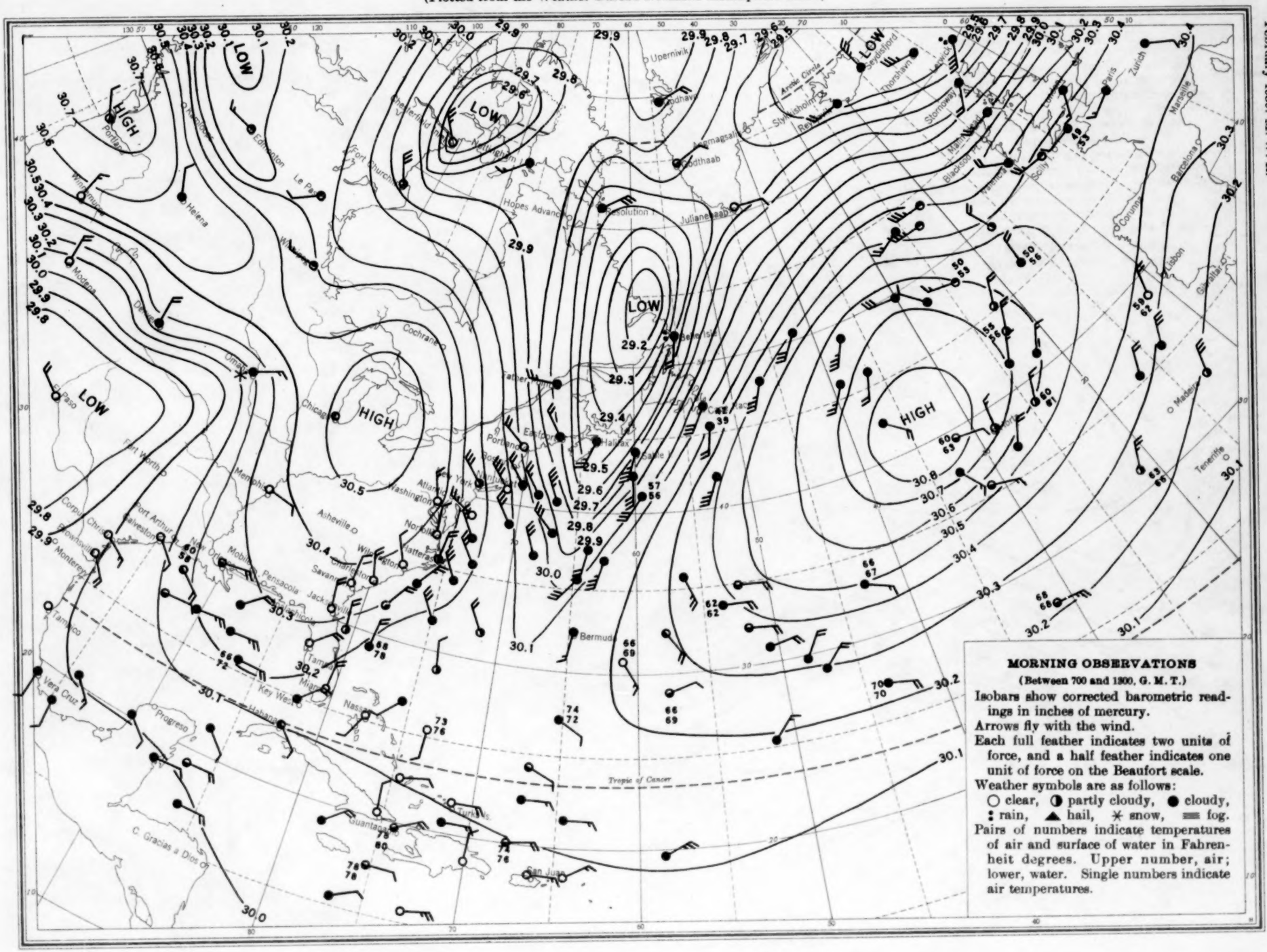
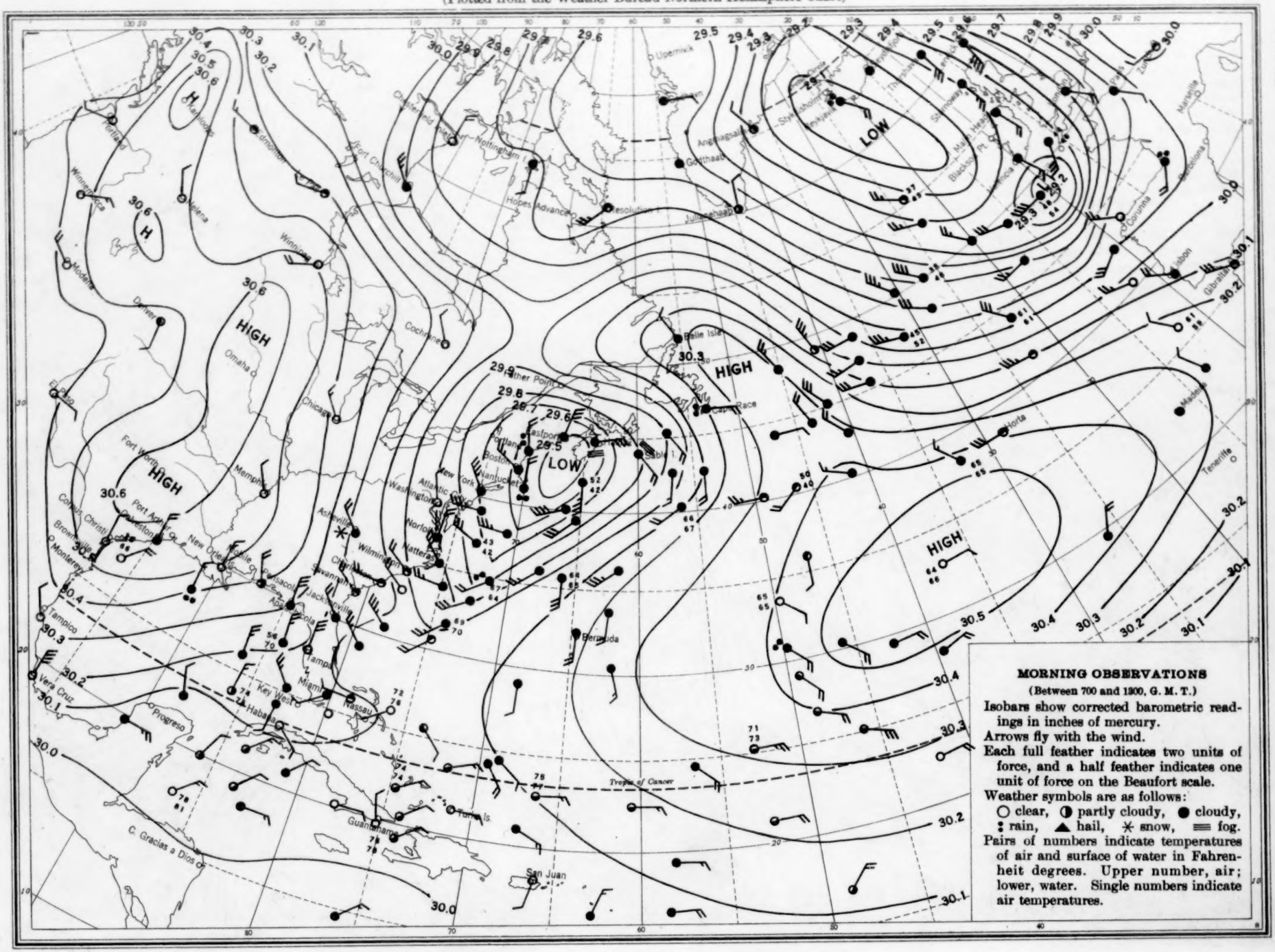


Chart XIV. Weather Map of North Atlantic Ocean, February 22, 1939

(Plotted from the Weather Bureau Northern Hemisphere Chart)


HIGH
LOW
HIGH
HIGH
LOW
HIGH
Tropic of Cancer
MORNING OBSERVATIONS
(Between 700 and 1900, G. M. T.)
Isobars show corrected barometric readings in inches of mercury.
Arrows fly with the wind.
Each full feather indicates two units of force, and a half feather indicates one unit of force on the Beaufort scale.
Weather symbols are as follows:
○ clear, ◑ partly cloudy, ● cloudy,
: rain, ▲ hail, ✳ snow, ≡ fog.
Pairs of numbers indicate temperatures of air and surface of water in Fahrenheit degrees. Upper number, air; lower, water. Single numbers indicate air temperatures.